35th Year

AUGUST, 1951

RUBBER AGE

BLACK-OUT

A PROTECTIVE FINISH

for

RUBBER PRODUCTS

adheres well • easy to apply
resistant to ozone, oils, acids

SUPPLIED IN BLACK, WHITE, CLEAR
color dispersions also available

R. T. VANDERBILT CO. INC.
230 Park Avenue, New York 17, N. Y.

For easier processing GR-I stocks

USE DU PONT POLYAC

a stiffening agent and activator

WITH POLYAC it is possible to maintain constant plasticity over a wide temperature range or to actually increase the stiffness of GR-I stocks. Thus, the tendency of GR-I inner tubes to thin out at the splice is reduced . . . cold flow of uncured slabs is minimized . . . handling is made easier. In addition, there's the advantage of Polyac activation. With thiuram acceleration, for instance, Polyac imparts high modulus and low set. And, hot tear is greatly improved over that obtained with conventional activation.

For more information on processing techniques using Polyac in GR-I stocks, see Report BL-177, "Polyac in GR-I Inner Tubes" and BL-233, "Polyac as a Stiffening Agent for GR-I." Extra copies are available. Ask your Du Pont representative or write: E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division, Wilmington, Delaware.

HAVE YOU TRIED

POLYAC NL

ACCELERATOR FOR

NEOPRENE LATEX?

POLYAC NL can be readily dispersed by ball milling for easy addition to neoprene latex compounds. It gives fast cures alone, or it can be used as an activator for thiazole or dithiocarbamate accelerators.

For more information on the use of Polyac NL in neoprene latex, see Report BL-194, "Polyac, Accelerator for Neoprene from Latex Compositions."

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E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

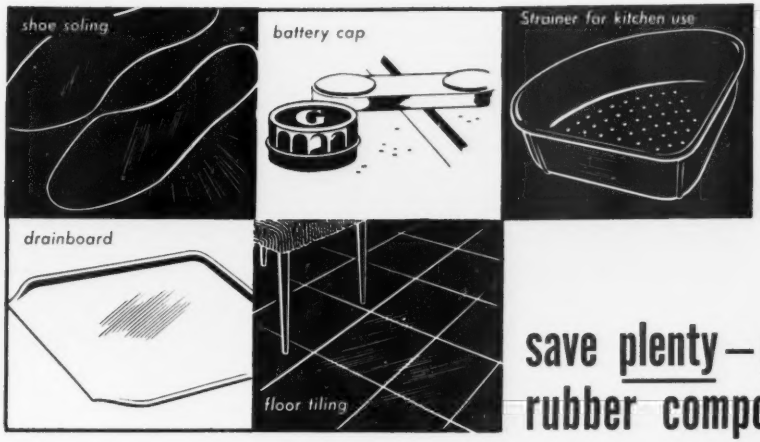
DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

THE RUBBER AGE, published monthly by The Palmerton Publishing Co., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered as second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. August, 1951. Vol. 69, No. 5.

News about

B. F. Goodrich Chemical Company ***raw materials***



save plenty—get improved rubber compounding, too!

...with Good-rite RESIN 50

HERE'S an easy-processing, reinforcing agent that cuts rubber compounding costs—and helps you get improved finished products.

First big advantage of Good-rite Resin 50 is that it provides a new and simple compounding approach to hardness problems. As an example—it's a means of filling in the gap between soft rubber compounds and ebonites.

Good-rite Resin 50 brings *more* advantages. It saves time by eliminating masterbatching. Your rubber compounds gain better flex life, higher elongation, improved abrasion resistance. They are more easily handled because Resin 50 acts as a plasticizer at processing temperatures.

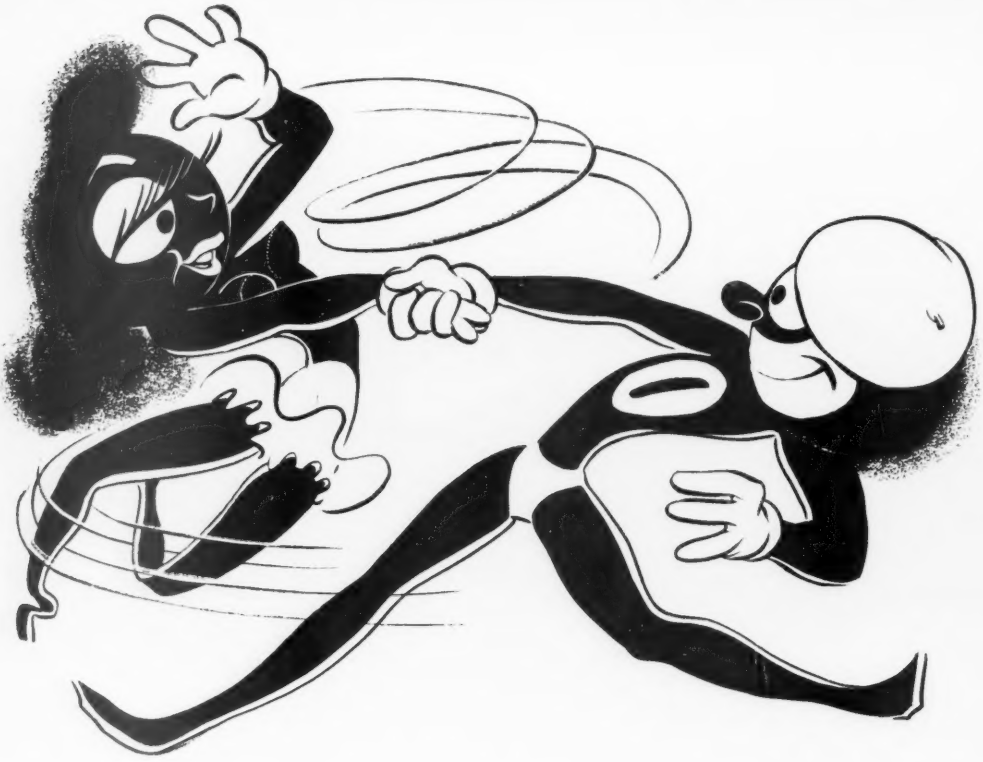
For extruded shapes such as gaskets, tubing, coving, etc., especially on hard compounds, Resin 50 provides improved surface smoothness and superior processing characteristics in the extruder.

A white, free-flowing powder, Good-rite Resin 50 can be compounded in a wide range of colors. Send for technical information. Find out how Good-rite Resin 50 can give you *better* results at *lower* costs. Just write Dept. CA-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg U S Pat Off
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



For long flex life, the records show, The black to use is **Philblack* O!**

Before taking off in wild Apache dances, we suggest both partners be well compounded with Philblack O.

In natural and synthetic rubbers alike, Philblack O puts plenty of two-way stretch in flex life. And while improving suppleness and pliancy, this premium quality furnace black also imparts extremely high abrasion resistance.

Our technical representatives will be glad to discuss the high flex and high reinforcing properties of Philblack O in natural, GR-S, reclaim and low temperature polymers.

Hopper cars of Philblack O shipped from Borger, Texas. Bagged Philblack shipped from Borger and seven warehouses.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

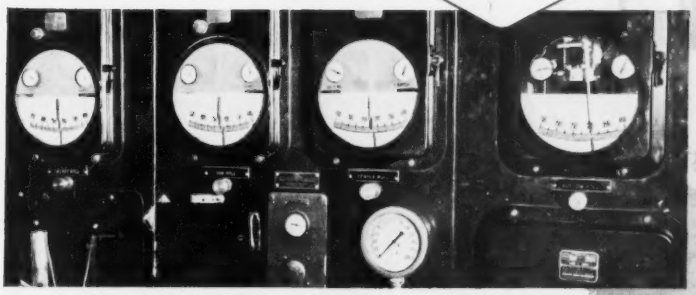
EVANS BUILDING · AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N. Y.

* A Trademark

Philblack A and Philblack O are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton.
West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

Process at temperatures from 20° to 40° lower with PLIOVIC



HERE'S PROOF—close-up of thermometers showing actual calendering temperatures used in processing PLIOVIC—20-40 degrees less than those used with comparable resins.

USE PROVED *Products*

WHEN you process with PLIOVIC—Goodyear's unique, high molecular weight vinyl copolymer—you can operate at from 20° to 40° lower temperature than with resins of comparable physical properties, whether you are using mills, calenders or extruders.

In addition to the processing advantage this brings you, you can load PLIOVIC with extenders with less sacrifice of physical properties—making for economy. PLIOVIC needs less of costly and scarce plasticizers, yet gives you high-strength properties, toughness at low temperatures, good heat stability, good light stability, high resistance to flex-fatigue and excellent chemical resistance.

Films made with PLIOVIC have excellent "hand" and drape. Other current uses include flooring, hose, tubing, molded items, and organosols, for unsupported film and for fabric and paper coatings. Ask for further details, and sample for your own evaluation by writing today to:

GOODYEAR, CHEMICAL DIVISION
AKRON 16, OHIO

GOODYEAR

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Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

In Neoprene, PROTOX ZINC OXIDE AIDS BANBURY PERFORMANCE

In neoprene, Protox-166* serves not only as accelerator and acid-acceptor, but also as a plasticizer that steps up Banbury performance.

While conventional zinc oxides appear to have a definite plasticizing action in hard-to-process neoprene compounds, Protox-166 is distinctly more effective—as shown in the accompanying power consumption charts.

The special coating of zinc propionate on Protox-166 also provides faster and more complete pigment dispersion (shown below), which increases Banbury output.

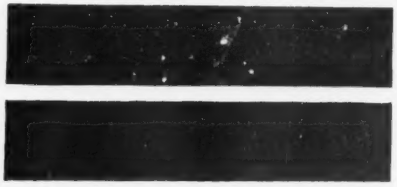
*U.S. Patents 2,303,329 and 2,303,330

POWER CONSUMPTION CHARTS OF NEOPRENE-W MASTERBATCHES

Conventional zinc oxide strongly resists wetting by neoprene, so requires high initial power (right).

The patented coating on Protox is a highly effective wetting aid. It eliminates costly power peaks.

ZINC OXIDE DISPERSIONS IN NEOPRENE-W MASTERBATCHES



ZINC OXIDE-A Conventional zinc oxide, being untreated, disperses more slowly and less perfectly than Protox-166.

PROTOX-166 This oxide disperses rapidly and completely, because it has been treated with propionic acid.

THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

. . . most used by rubber manufacturers since 1852

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There are

13 properties of SOLKA-FLOC®

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7. Fibrousness
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11. Non Abrasiveness
12. Absorbency
13. Softness

And one or all are sure to better your product . . . increase your profits. Find out what Solka-Floc can do for you. Send your processing problems to our Technical Service Department for samples and recommendations.

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LINERETTE provides a quick, easy method of separating stock without adhesion.

•

LINERETTE preserves the tackiness of the stock.

•

LINERETTE contains no oil or wax which might migrate.

LINERETTE, in use for over 20 years, is thoroughly tried and proved. It is a specification sheet, made to rigid standards of quality. Although we do not suggest LINERETTE as a substitute for Holland cloth, we believe some companies have been so using it with success. We can furnish LINERETTE in any width up to and including 54", in rolls of 9", 11½", 13", and 15" diameters; put up on 3" i.d. cores. The yield is approximately six square yards to the pound. A 9" roll contains 375 linear yards and a 15" diameter about 1150 linear yards. We will send you samples — simply specify width desired.

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LINERETTE
INTERLEAVING PAPER

CLIMCO CLIMCO

higher product quality—but saves thousands of dollars

by using golf ball covers made of

Plio-Tuf

BETTER ADHESION, GREATER CUT RESISTANCE of golf ball covers made with PLIO-TUF (left, two samples) are shown by strip test and "Guillotine" test. Compare with the right two samples, showing balls made with ordinary natural resin. Photo courtesy Plymouth Golf Ball Company.

USE PROVED *Products*

BY using PLIO-TUF for his golf ball covers, this manufacturer has saved literally thousands of dollars each year over the cost of his previous compounds—made with a natural resin. Yet using Goodyear's synthetic copolymer resin, PLIOLITE S-6B, and rubber in a PLIO-TUF compound has meant no sacrifice of product quality.

Golf balls made with PLIO-TUF show improved resistance to cuts—better adhesion between cover and winding. And "click" is maintained, too—as audible proof of product quality.

PLIO-TUF compounds are in use in a wide range of applications where impact resistance, toughness, hardness, or rigidity are important. At present, the PLIOLITE resins used in the manufacture of PLIO-TUF are all in short supply. However, you can secure samples for laboratory evaluation, together with full information, so write today—and plan for future use.

Goodyear, Chemical Division
Akron 16, Ohio

DON'T FORGET to attend the World Chemical Conclave and Diamond Jubilee Meeting of the American Chemical Society—September third to seventh.

GOODYEAR

Plio-Tuf, Pliolite—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

10,000 Pounds Constant Tension

under fingertip control...

... in this

IOI Nylon Tire Fabric Latexer

Complete one-man process control is but one of the many outstanding advanced-design features of this **IOI** latexing machine. Here are just a few of the others:

- **Simultaneous impregnation, drying and attenuation of the cords, resulting in pre-stretched tire fabric that requires no further processing prior to calendering.**
- **Direct gas-fired heating, under complete control, provides the correct high temperature required for the most efficient rate of drying either woven or weftless fabric.**
- **Rugged in construction, yet extremely flexible in operation, with constant-tension control at all speeds.**
- **Units available in various capacities, from small production machines up to high speed calender train installations.**
- **These machines require very little cleaning and a minimum of housekeeping maintenance.**

An Industrial Ovens engineer will be glad to call at your convenience to discuss the application of this machine to your particular latexing requirements.

INDUSTRIAL OVENS, INC.

IOI ENGINEERING VERSATILITY

13825 TRISKETT ROAD CLEVELAND 11, OHIO

Naugatuck

ROYAL FAMILY OF PLASTICS

Naugatuck Marvinol is in your plastic future!

This could be the unveiling of a bright, new future for *your* products.

For the product wonders in this crystal ball have been worked by a marvelous material from which your products could be made — Naugatuck Marvinol vinyl resin.

Here is a Marvinol-made handbag — *soft* and *pliable* as leather — yet perfectly washable, and it *won't crack, peel, scuff or fade.*

Here Marvinol is *rigid* and *rugged*—in a fountain pen barrel. There it is *flexible*—in wire covering.

Here are high-style tapestries with a softly woven look and feel. And colorful upholsteries with a *stability* that *holds their shape and fit.* And a snag-free zipper that closes with *no track!*

All these and hundreds more products can be made with Marvinol — rigid as steel, flexible as fabric, crystal clear or opaque, in all colors. In fact, Marvinol can be almost anything *you* want to make it.

Marvinol comes from the Naugatuck Chemical Division of the United States Rubber Company — a basic source of raw materials. It's in the plastics business to *stay* and *grow* with you. Write us and see what Marvinol can do for *you.*

Naugatuck Chemical **Division of UNITED STATES RUBBER COMPANY**

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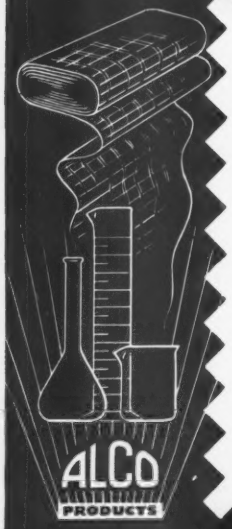
BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia • In Canada: Naugatuck Chemicals, Elmira, Ontario

MARVINOL® vinyl resins • KRALASTIC® styrene copolymers • VIBRIN® polyester resins



VULCANOL*

A Group of Latex Compounds for Sizing, Coating and Impregnating Textile Fabrics.

ALCOGUM

Synthetic Thickeners for Latex Compounds

VULCARITE

Dispersions of Latex Compounding Chemicals

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Technical information and samples available promptly upon request.

* Registered Trademark

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TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

SOUTHERN DISTRIBUTORS
WICA COMPANY INC.
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Hose REINFORCEMENT WIRE

JOHNSON special bronze plated wire, for many years the preference of major tire manufacturers — now available for vacuum and defroster hose producers, in addition to conventional liquor finish wire.

- Uniformly clean finish
- Maximum adhesion to rubber
- Higher elongation
- Extra fatigue properties

Johnson line of specialty wires also includes oil-tempered and cold-drawn brush wire — tire bead wire — steel wire for field telephones — music spring wire.

If it's steel wire — JOHNSON specialists make it better

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STEEL AND WIRE COMPANY, INC

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pound for pound . . .

CRYSTEX

contains more Insoluble Sulphur

● Prove it to yourself by analyzing equal units of CRYSTEX and any other product. You'll find that CRYSTEX is at least 85% insoluble in Carbon Bisulphide, topping the field in this respect. This high insoluble sulphur content actually makes CRYSTEX more economical and many users find that it helps produce a better product.

Why not consult us about the possible use of CRYSTEX Insoluble Sulphur to improve your products or decrease their cost?

Other Stauffer Rubbermakers' Chemicals

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- Carbon Bisulphide
- Caustic Soda • Sulphur Chloride • Borax
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Stauffer CHEMICAL COMPANY SINCE 1848

STAUFFER CHEMICAL COMPANY
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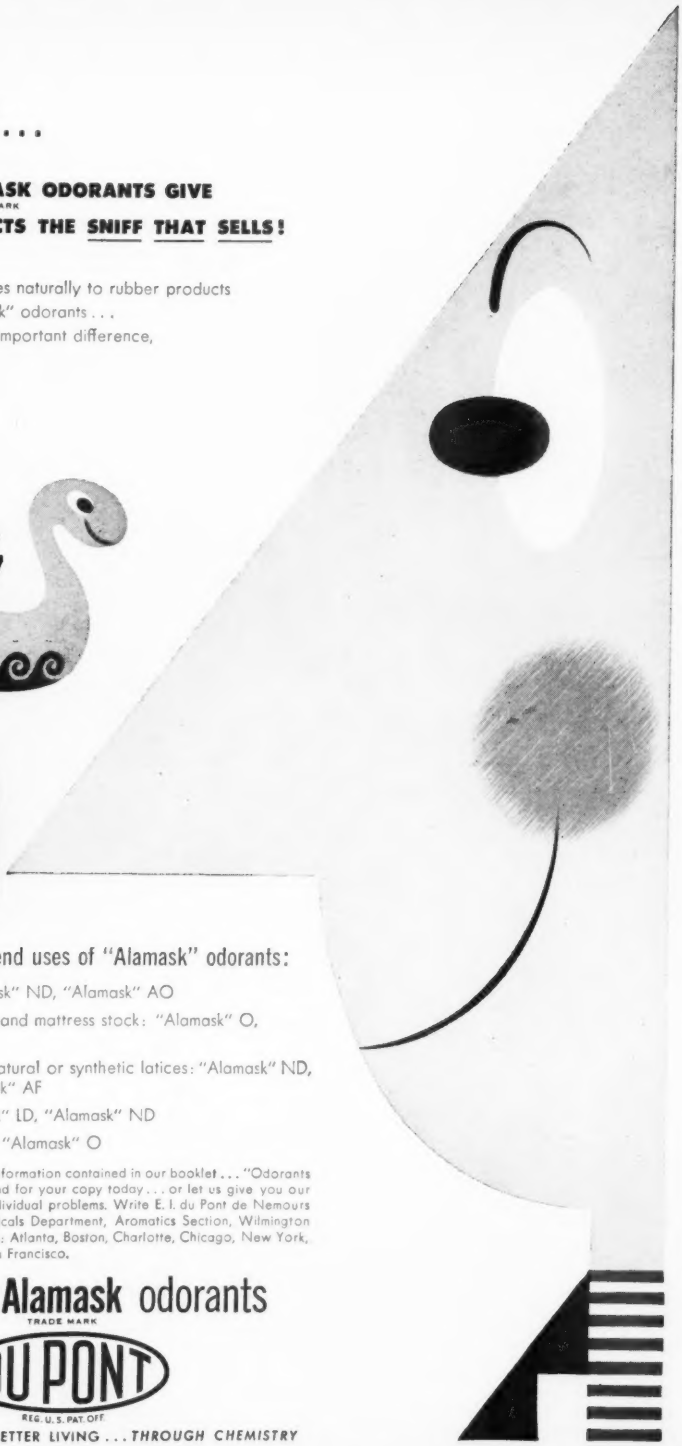
DU PONT ALAMASK ODORANTS GIVE
TRADE MARK
RUBBER PRODUCTS THE SNIFF THAT SELLS!

Customer appeal comes naturally to rubber products when you use "Alamask" odorants . . . "Alamask" makes that important difference, the *sniff that sells!*



Here are just a few successful end uses of "Alamask" odorants:

Rug underlays: "Alamask" ND, "Alamask" AO

Foamed sponge pillow and mattress stock: "Alamask" O, "Alamask" OS

Shoe adhesives, from natural or synthetic latices: "Alamask" ND, "Alamask" BG, "Alamask" AF

Rug backings: "Alamask" LD, "Alamask" ND

Natural smoked sheet: "Alamask" O

And this is just a part of the information contained in our booklet . . . "Odorants for the Rubber Industry." Send for your copy today . . . or let us give you our recommendation for your individual problems. Write E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Aromatics Section, Wilmington 98, Delaware. Branch Offices: Atlanta, Boston, Charlotte, Chicago, New York, Philadelphia, Providence, San Francisco.

Du Pont **Alamask** odorants
TRADE MARK

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

PICCOUMARON

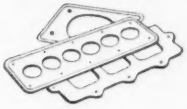
Para-Coumarone-Indene

RESINS

PICCO

A GROUP OF THERMOPLASTIC SYNTHETIC RESINS USEFUL FOR÷

TUBULAR GOODS



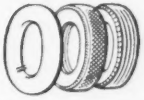
GASKETS

WATERPROOFINGS

HEELS

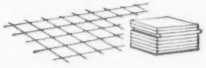
HARD RUBBER GOODS

TOYS



TIRES AND TUBES

ADHESIVES



FLOOR TILE

WAX COMPOUNDS

BELTING

SHOES • BOOTS

CEMENTS

JAR RINGS

TEXTILES

The applications shown above indicate some of the almost endless uses for this excellent resin.

Piccoumaron Resins are available in grades from liquids to brittle solids. Colors vary from pale yellow to deep reddish brown. They are soluble in coal tar, turpentine, terpene and most chlorinated solvents. Good resistance to acids, alkalies and salt.

Write for samples and complete data on PICCOUMARON Resins.

PICCO

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

Clairton, Pennsylvania

Plants at

Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

Distributed by

Harwick Standard Chemical Co., Akron 5, Ohio

PHOTOGRAPH: UNITED AIR LINES

"Up in the Air" About Solvents?

Skellysolve for Rubber and Related Industries

Applications

SKELLYSOLVE B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound.

SKELLYSOLVE C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve B.

SKELLYSOLVE D. For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds.

SKELLYSOLVE H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve D is desired.

SKELLYSOLVE E. For use wherever a relatively slow drying solvent is desired.

SKELLYSOLVE R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency.

"DOC" MacGEE SAYS: You benefit in many ways when your solvent problems are dissolved with Skellysolve! Strict laboratory controls mean that every batch of Skellysolve is the same. You get *uniformity* that protects your product's quality and helps your salesmen to get new business as well as to hold old customers.

No bloated containers because of high vapor pressure—no blisters in tires or shoes due to blushing or high boiling compounds. No seeds in cements due to low boiling compounds. And high bonding strength because of freedom from greasy residues.

From various standpoints, you're better off with Skellysolve. It is less toxic than some other solvents, therefore reduces health hazards. It is sweet-smelling, pleasant to work with—and it won't freeze at atmospheric temperature.

Check Skellysolve from every angle—low end points, quick evaporation, low vapor pressure, minimum of unsaturates and pyrogenic decomposition products — just the characteristics you look for.

Get complete technical facts. Write today for full information on Skellysolve!

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY
KANSAS CITY, MISSOURI

Farrel mills can be equipped with remote-controlled strip cutter and roll adjustment for regulating the feed to calender or tubing machine. When actuated by push buttons from the next machine in the line, these motor-operated units will vary the width or thickness of the ribbon of stock being taken from the mill and prevent "choking" or "starving" of the succeeding machine.

For almost a century, Farrel-Birmingham has worked closely with the rubber industry in developing individual processing units to meet the needs of the industry. In addition, the company's *Engineering Planning Division* specializes in the development of complete production layouts. Designed for specific sets of conditions, these installations improve production efficiency and reduce handling costs through planned processing flow.

Write for further details of this unique engineering service or for information about any of the production units listed.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-886

A — Farrel-Birmingham mills are available in a complete range of sizes, from 6" x 13" for the laboratory up to 28" x 84" heavy duty machines for the factory. For special requirements, variations in design as well as a wide choice of drive arrangements are obtainable, often from existing plans. Bulletin 173 describes these machines in detail.

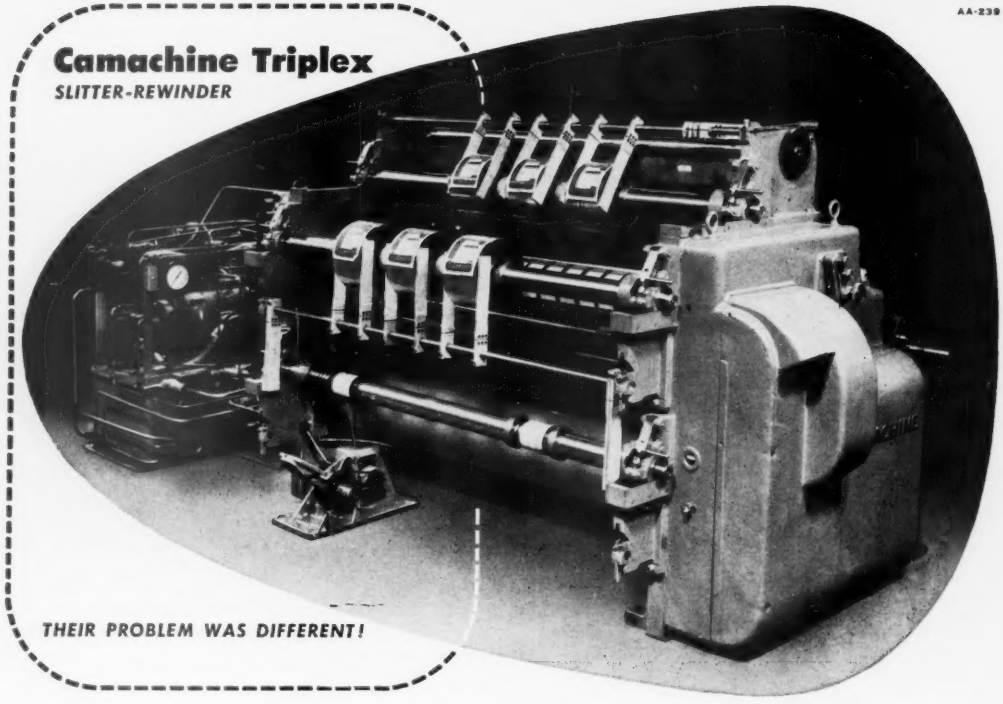
B — Two types of strip cutters are available—hand-operated or motor-operated with push-button control. Two or more knives can be supplied.

F-B PRODUCTION UNITS

Banbury Mixers • Plasticators Pelletizers • Mixing, Grinding, Warming and Sheeting Mills • Bale Cutters • Tubing Machines • Refiners • Crackers • Washers • Calenders • Hose Machines • Hydraulic Presses • and other Equipment for Processing Rubber and Plastic Materials.

AA-239

Camachine Triplex
SLITTER-REWINDER



THEIR PROBLEM WAS DIFFERENT!

when you must depend on experience . . .

A large producer of acetate film ordered a battery of high-speed slitter-rewinders to use in processing their product. Characteristics of the material called for highly sensitive web tension control throughout the slitting and rewinding operation, and for razor-clean slitting. Provision had to be made for producing rolls of uniform density regardless of variations in the caliper of the material. Since core heat would ruin the inner laps of the rewound rolls it was necessary to minimize heat generated by friction between core and rewind shaft. Other requisites included: positive roll separation; trim rewind for salvage; 15″ diameter rewind and speed of 800 feet per minute. And no complicated gadgets — the machines had to be designed for economy, simplicity, durability and low-cost maintenance.

. . . you can depend on Camachines®

The new Camachine Triplex slitter-rewinder was specifically developed to meet the requirements outlined above. The Triplex is a *new* machine, designed to meet a *new* set of operating conditions, and featuring several *new* principles in slitter-rewinder engineering. The Triplex is *new*, yes, but its design is deeply rooted in Cameron Machine Company's sixty years of specialization and leadership in the manufacture of roll production equipment. The new Triplex has proved again that when you have to depend on experience you can depend on Camachines!

For complete information write to:
Cameron Machine Company · 61 Poplar Street · Brooklyn 2, N. Y.

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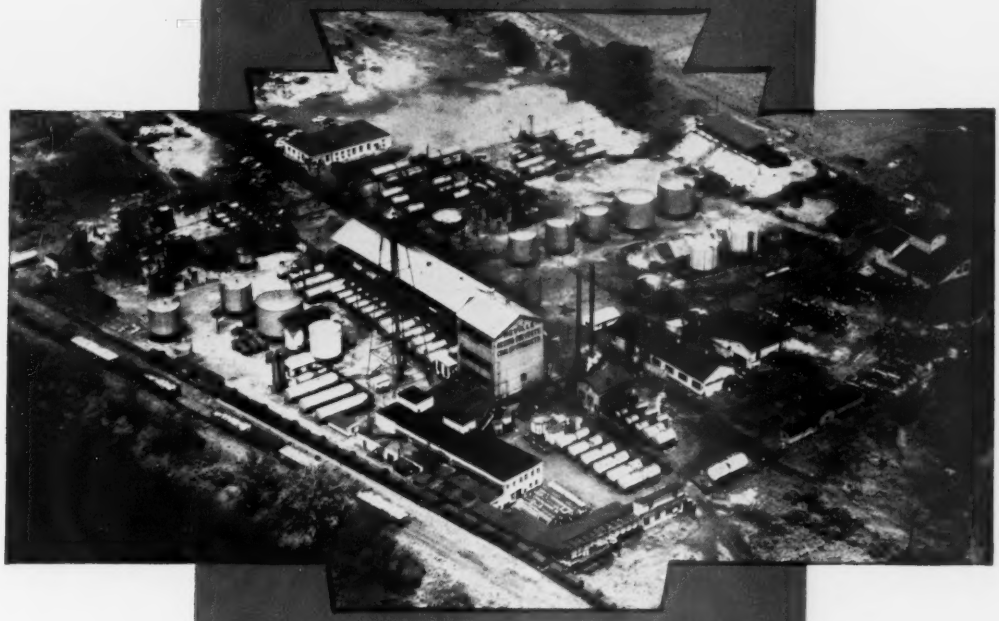
... NOW MORE THAN EVER



Partial view of plant at Neville Island, on the Ohio River, 8 miles west of Pittsburgh, Pa., showing main resin manufacturing and solvent refining units.

Neville service to industry is characterized by a traditional policy of continuous development and expansion, and co-operative technical assistance that means much to the buyer of chemicals. You can be sure of any Neville product you use for rubber compounding . . . whether for mechanicals, footwear, molded products, insulation, floor tile or reclaiming.

THE NEVILLE COMPANY **NEVILLE** PITTSBURGH 25, PA.

Plants at Neville Island, Pa., and Anaheim, Cal.

R-45

You can improve

FLEXING

HARDNESS

TENSILE

DISPERSION

PROCESSING

with

A solid, friable terpene-copolymer resin, effective in highly-loaded GR-S and natural rubber stocks

POLYMEL C-130

Laboratory-tested and factory-proved, this new resin shows remarkable properties where it counts most—in the factory and in competitive compounds.

For example, in one SM sole stock 32 parts of POLYMEL C-130 replaced 80% of the oil, 50% of the high styrene resin and 50% of the SUBLAC B-2-A. This factory stock processed well, showed good dispersion of the ingredients, had higher hardness and tensile than the original compound, *and showed a 3-to-1 increase in flex life!*

These are typical of factory runs with POLYMEL C-130. In addition, its low melting point of 210°F makes it an excellent plasticizing-processing resin for short cycle batches.

POLYMEL C-130 is low priced and readily available. If you haven't done so yet, send for your sample today, or, better yet, ask for a sample and order enough for a trial run in your plant. You'll be gratified with the results.

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D-Tac	Detackifyer
Gilsowax	Extender—Wire Compounds
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Polymel 6	Tires—Camelback Solid
Polymel 7	Tires—Camelback Carcass-Liquid
Polymel D	Polystyrene-Indene Plasticizer

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20½c lb.—under 1000 lbs.
fob factory in drums

Send for your sample today!

THE POLYMEL CORP.

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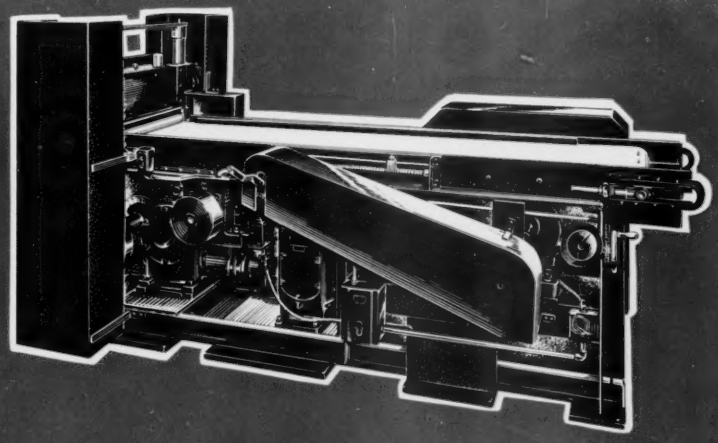
FOR *fast, accurate* OPERATION AND LOW MAINTENANCE COST IT'S FAWICK *everytime!*

Manufacturers and users of rubber processing machines have long recognized the operating advantages of Fawick Airflex Clutches and Brakes on their equipment. They know that the split-second action of Fawick units produces faster starts and stops, resulting in shorter operating cycles and increased production. They also know they can rely on the safe positive action of FAWICK to deliver full power.

Accurate high speed operation, low maintenance cost, and long, trouble-free operating life under most severe use, are but a few of the "built-in" Fawick characteristics.

When you consider all the advantages Fawick units will bring to your machines, your natural answer to peak production on your equipment is FAWICK AIRFLEX CLUTCHES AND BRAKES.



Akron Standard Mold "Powerman" Guillotine Cutter equipped with a Fawick 10CB300 Clutch, and 10CB300 and EEB250 Brakes.

For specific information on all advantages of Fawick Industrial Clutch and Brake Units, write to the Main Office, Cleveland, Ohio, for Bulletin 300.

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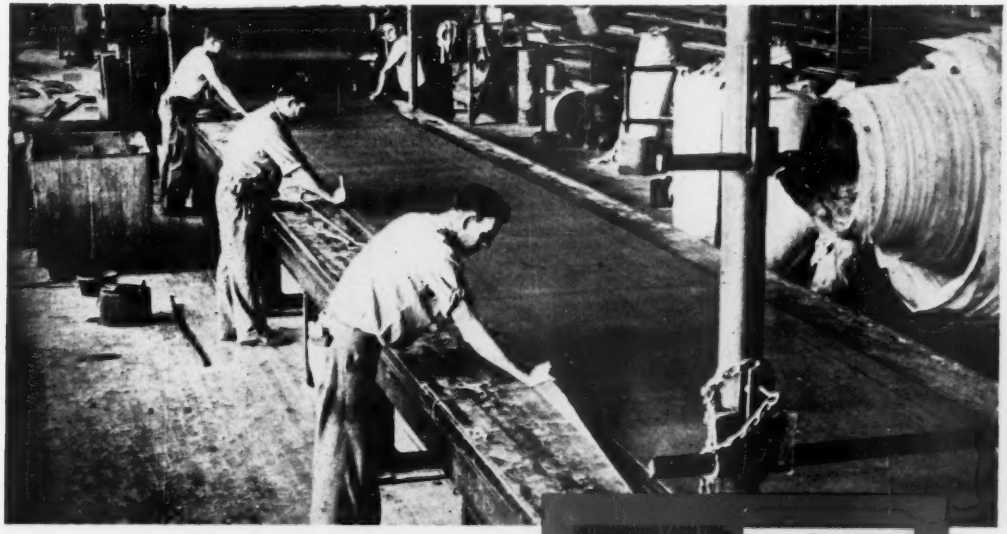
Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.



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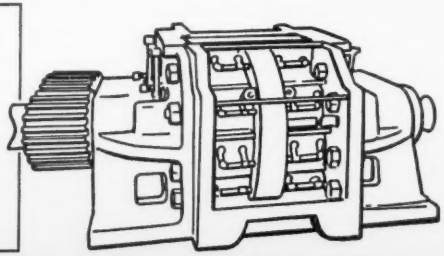
We have for sale or interchange Banbury bodies in both spray and jacketed types, and we can also supply parts for most sizes. Tell us your requirements.



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with better

PIGMENT DISPERSION IN ALL TYPES OF RUBBER STOCKS...

PLASTICIZER HSC-13 (LIQUID)

A new, tested plasticizer, HSC-13 offers vital advantages as an aid to mixing and pigment dispersion . . . It cuts down on the mixing cycle and at the same time gives better dispersion, making it possible to increase output . . . HSC-13 will give slightly increased hardness, better flex life, higher elongation and abrasion resistance. It is effective in low grade stocks with high filler content as well as with natural rubber, GR-S, Nitrile or with blends of various rubbers.

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Plasticizer-Peptizer, PLASTONE is non-toxic, practically odorless and does not impart any color to the compound. It greatly improves dispersion of pigments, resistance to abrasion, aging and flex-cracking. Milled and calendered blanks remain firm with minimum shrinkage — an important advantage where automatic cutting of hot stocks is employed . . . PLASTONE smooths out dry, rough stocks, acts as a non-blooming fatty acid, activates thiazole accelerators, reduces viscosity of rubber solutions . . . It has a strong affinity for all types of synthetic, natural and reclaim rubbers.

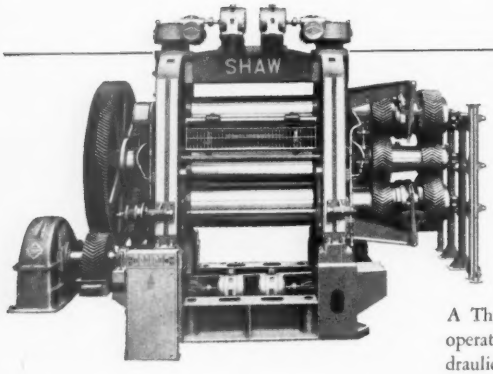
Write for bulletins giving complete technical data on these plasticizers.

HARWICK STANDARD CHEMICAL CO.

AKRON, OHIO

BRANCHES: BOSTON, TRENTON, CHICAGO, LOS ANGELES

* KEEP IN STEP WITH THE TIMES



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In an industry as progressive as that of rubber manufacture, the engineer is constantly asked to accomplish the unknown, if not the 'impossible'. That is where SHAW experience of the whole field of rubber and plastics machinery comes in—with so many steps behind us, the next forward step comes readily to our enterprise.

A Three-roll Calender with four-motor individually power operated roll adjusting gear, push button controlled, hydraulic jacks fitted to maintain constant pressure on top roll bearings and adjusting gear.
Flood lubrication to roll bearings for high temperature work and reduction of maintenance.

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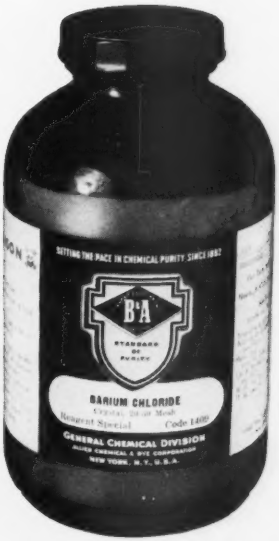

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B&A has over 1,000 laboratory chemicals for you to choose from.

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always meet or exceed A.C.S. specifications.

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from B&A's own well-stocked distributing stations situated in key centers everywhere.

B&A SAVES YOU *time, money, effort in your laboratory chemical buying.* When you specify B&A, you can choose from more than 1,000 purity products of Reagent, A.C.S., C.P., U.S.P., N.F., and Technical grades.

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Contact the B&A office nearest you and tell them your needs. Your B&A salesman will work with you in having our local stocks built to meet your requirements.

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Available in *three forms*
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SA 57-0 Powder form, untreated. Preferred by many for latex compounding.

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SA 57-9 Xtruded form. Treated with inert rubber-soluble binder. Free flowing, dustless, with improved dispersibility due to fine particle size of coated product.

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United channel blacks have been in use for decades and have an enviable record of satisfactory performance. They are uniform, dependable, and ever in demand.

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United channel blacks compel attention. The bags are trim looking, tightly sealed, colorfully printed and readily identified either by a code number or your pigment number.

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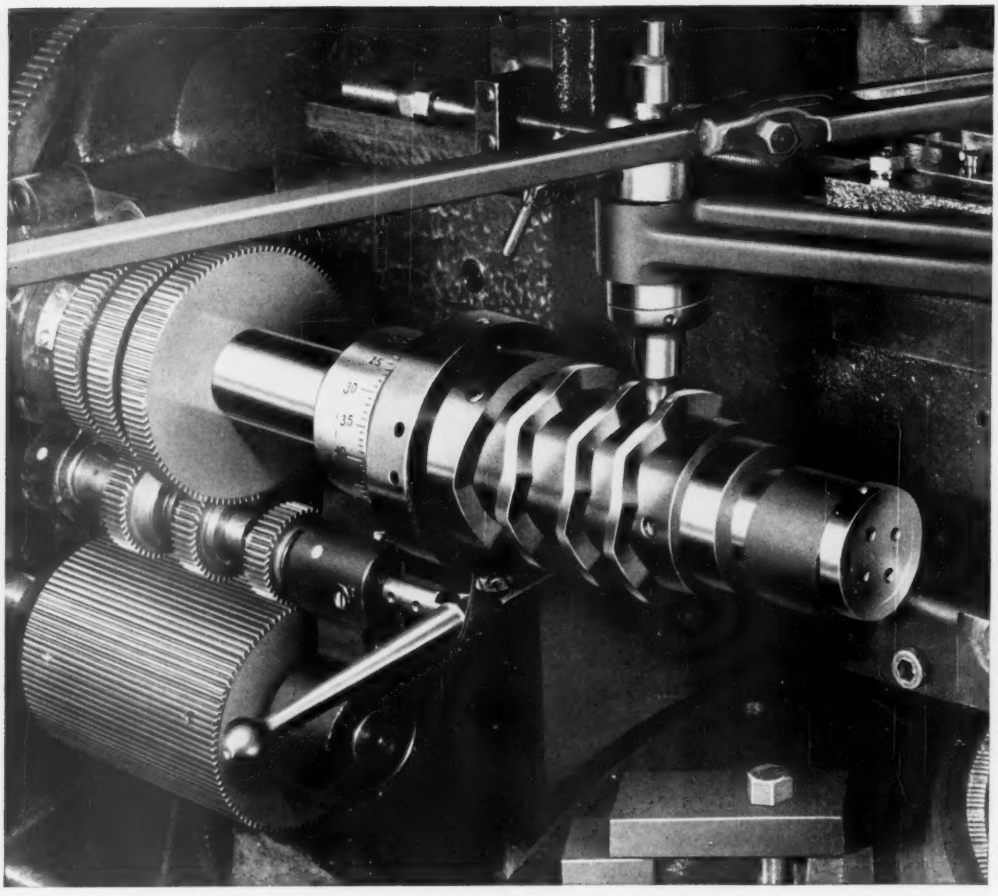

WHY VARIABLE PITCH MOLDS NO LONGER COST A PREMIUM

UNTIL the development by BRIDGWATER of the transmission shown above, engraved tire molds of the variable pitch type were substantially more expensive than molds of a uniform pitch.

This ingenious unit is a special attachment we use on our BRIDGWATER MOLD ENGRAVING MACHINES*. By shifting the gear lever to any one of three different positions, a long, short or medium pitch may be cut with unfailing accuracy and at a cost essentially no greater than cutting a uniform pitch . . . just another example of our determination to make molds of whatever characteristics the tire industry requires . . . at the lowest possible cost.

* Designed and built by Bridgwater and used by leading mold makers the world over.

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FOR BETTER MOLDS FOR BETTER TIRES *SPECIFY* BRIDGWATER

We're Particular about our PLASTICIZER "Prescriptions" too!

As a matter of fact, we probably go the old pharmacists *one better* when it comes to being exacting about making Pittsburgh PX Plasticizers. For, as a basic, integrated producer of coal chemicals—many of which are used by America's great plastics and rubber industries—we have the advantage of controlling the *quality* and *uniformity* of our plasticizers from coal to finished product . . . an advantage that assures *you* greater economy and ease of use in your plastics formulations.

When you think of dependable plasticizers, think of Pittsburgh PX Plasticizers —one member of a growing family of basic chemical products which serve the nation's industry and agriculture.

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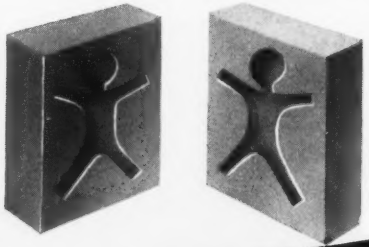
Relief

FROM A HOST OF "HEADACHES" IN RUBBER MOLDING—



with this improved G-E SILICONE MOLD RELEASE AGENT

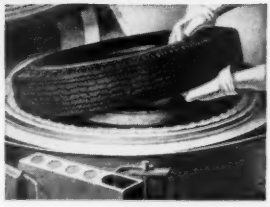
Production records in rubber companies, large or small, tell the remarkable story of General Electric's silicone mold release agent SM-61*. You get fewer rejects . . . reduced mold down time for cleaning . . . more *even* release . . . better products faster . . . as compared with conventional mold release agents! SM-61 is today's leading mold release agent, and here are the reasons why . . . these *proved* advantages with SM-61 . . .

- **Excellent Mold Coverage**—SM-61 gives outstanding performance on intricate molds.
- **Stability at Higher Temperatures**—SM-61 remains stable at temperatures up to 150 F.
- **Stability under Mechanical Working**—SM-61 won't break or cream under *repeated* recycling in centrifugal pumping systems.
- **Hard Water Stability**—SM-61 remains stable 24 hours at ½% dilution in water of over 200 P.P.M. hardness.
- **Many Other Advantages**—SM-61 will not stain light-colored stocks, is rust-inhibited, has low toxicity, and gives outstanding performance in numerous other ways.

These advantages are all *on the record* of large rubber plants and test laboratories. Why not try SM-61 for yourself? *Chemical Division, General Electric Company, Pittsfield, Massachusetts.*

For details, write to Section P-4, General Electric Company, Waterford, New York. (In Canada: Canadian General Electric Co., Ltd., Toronto.)

*Formerly G-E 81161



Tires are easily released untorn, unscratched—thanks to SM-61, which prevents pocketing.

Smoother finished rubber buttons are obtained through the even release provided by SM-61.

Silicones for the Rubber Industry

GENERAL ELECTRIC

SUNDEX-53 and CIRCOSOL-2XH

REVEALED AS THE OILS USED TO MAKE MORE RUBBER AVAILABLE

Rubber technologists recently discovered ways to greatly extend the supply of synthetic rubber by adding certain petroleum derivatives, in substantial quantities, to high-Mooney-viscosity polymers. In both the experimental work and plant production to date, Sundex-53 and Circosol-2XH have played vital roles. This significant fact is disclosed in recently published reports about the revolutionary processes. Following are two noteworthy extracts . . .

". . . Of the various oils tested, Sundex-53 and Circosol-2XH were both satisfactory plasticizers, and both have low volatility. These two oils were used in most of the work . . . One of the early questions was whether or not oils would be removed by heat from the plasticized high-viscosity rubbers. Experiments were accordingly designed to find oils which would be relatively non-volatile . . . It is apparent that two of these oils, Sundex-53 and Circosol-2XH, showed relatively low volatility under the test conditions."

Swart, G. H., Pfau, E. S., and Weinstock, K. V., "A Study of Plasticized High Mooney Viscosity Synthetic Rubbers," *India Rubber World*, June 1951.

"From February 21, 1951, when the oil-masterbatched GR-S (X-628) and oilblack masterbatched GR-S (X-629) were announced by RFC, until June 1, over 5 million pounds gross of X-628 and over 3 million pounds gross of X-629 were produced in the GR-S plant operated by Goodyear for RFC at Houston, Texas. The oil which has been used in these products to date is Circosol-2XH."

D'Ianni, J. D., Hoesly, J. J., and Greer, P. S., "Oil-Extended Synthetic Rubber, Including Oil-Masterbatched GR-S," *Rubber Age*, June 1951.

If you are processing any type of synthetic polymers it will pay you to run tests with Sundex-53 and Circosol-2XH. For specifications and typical formulations, write Dept. RA-8

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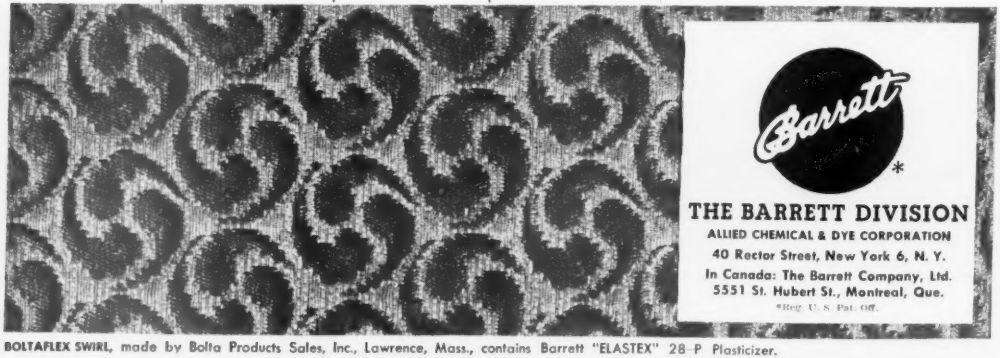
Appearance	Clear and free of suspended matter.	Clear, liquid	Clear, liquid	Cast solid or granular solid.	Clear and free of suspended matter
Odor	Mild, characteristic	Mild, characteristic	Very mild, characteristic	Mild, characteristic	Substantially none
Color (Hazen)	50 Maximum	50 Maximum	80 Maximum	150 Maximum (1:1 Toluene)	Water-white, (not darker than a solution of 0.0030 g. $K_2Cr_2O_7$ in one liter distilled water)
Specific Gravity, 20/20 C	0.985±0.002	0.986±0.003	1.078±0.003		1.048±0.001
Saponification No.	285±5		369±5		
Acidity (as Phthalic Acid), %	0.01 Maximum	0.01 Maximum	0.01 Maximum	0.01 Maximum when packed	0.01 Maximum
Ester Content, % by weight		99.0 Minimum		99.0 Minimum	99.0 Minimum
Melting Point, Deg. C.				63.5±1.5	
Foreign Matter, %				0.075 Maximum	
Containers	50-55 gal. steel barrels	50-55 gal. steel barrels	50-55 gal. steel barrels	Fibre drums containing approximately 250 lbs. net	50-55 gal. steel barrels



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BOLTAFLEX SWIRL, made by Bolta Products Sales, Inc., Lawrence, Mass., contains Barrett "ELASTEX" 28-P Plasticizer.

How to "wrap up" *improved production*

● If your production involves the application or forming of wire, consider this . . .

Because specialists at National-Standard's Worcester Wire Works probe *deep* into the development and behavior of special-purpose wires, they're often able to suggest modifications that boost production plenty! Sometimes, for example, it's a modification that eliminates machine jamming and down-time. It might be a new or different finish that permits increased production speeds. Or, as often happens, it's an idea that gets the job done with *less* wire or other materials.

You can always count on Worcester Wire Works for service that goes further than usual — for special development help if you want it. And, in any case, you'll find in your National-Standard wire the uniformity, the adherence to specifications that in itself saves time and dollars!

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ATHENIA STEEL..*Clifton, N. J.*	**Flat, High Carbon, Cold Rolled Spring Steel**
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WAGNER LITHO MACHINERY..*Jersey City, N. J.*	**Lithographing and Special Machinery**
WORCESTER WIRE WORKS..*Worcester, Mass.*	**Round and Shaped Steel Wire, Small Sizes**

DOW CORNING Mold Lubricants make easy release Automatic

Moe Muscles knows he's not a magician, but you can't blame him for taking some credit for the performance of Dow Corning Silicone mold release agents. Molded parts almost pop out of Dow Corning silicone treated molds, and he knows it. Release becomes a positive thing. It's more than freedom from sticking, even in molding heavily loaded stocks, heavy duty tires, precision moldings, or parts formed in complicated or deep cavity molds.

What's more, Inspector Mike can now be a pal instead of a stinker. Here's why. Unlike any other kind of mold lubricant, Dow Corning Silicones give easy release without build-up on the mold surfaces. Clean molds stay clean; scrap is reduced to the vanishing point; and you get top quality moldings with the kind of finish that sells to critical customers.

Dow Corning Silicones Mean Business!

For more information call our nearest branch office or write for data sheet M-8

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For Easier Release and Better Quality
SPECIFY
DOW CORNING SILICONE MOLD RELEASE AGENTS
EMULSIONS for molds and curing bags; MOLD RELEASE FLUID in solvent solution for green carcass, bead and parting line release.

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The *outstanding* delayed-action accelerator for natural, synthetic, and reclaimed rubbers.

Ideal for use with reinforcing furnace blacks in up-to-date tire-compounding.

No special handling required.

NOBS No. 1 is the last word in delayed-action accelerators. Convince yourself. Request samples and information for evaluation purposes from our sales representatives listed below.

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a new word
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SEE REVERSE SIDE

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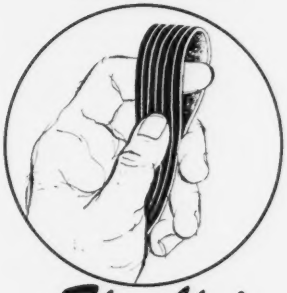

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Antioxidant	0.25
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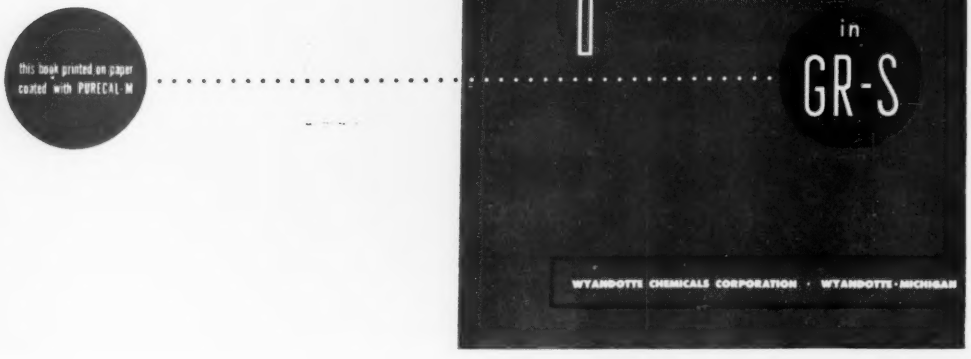

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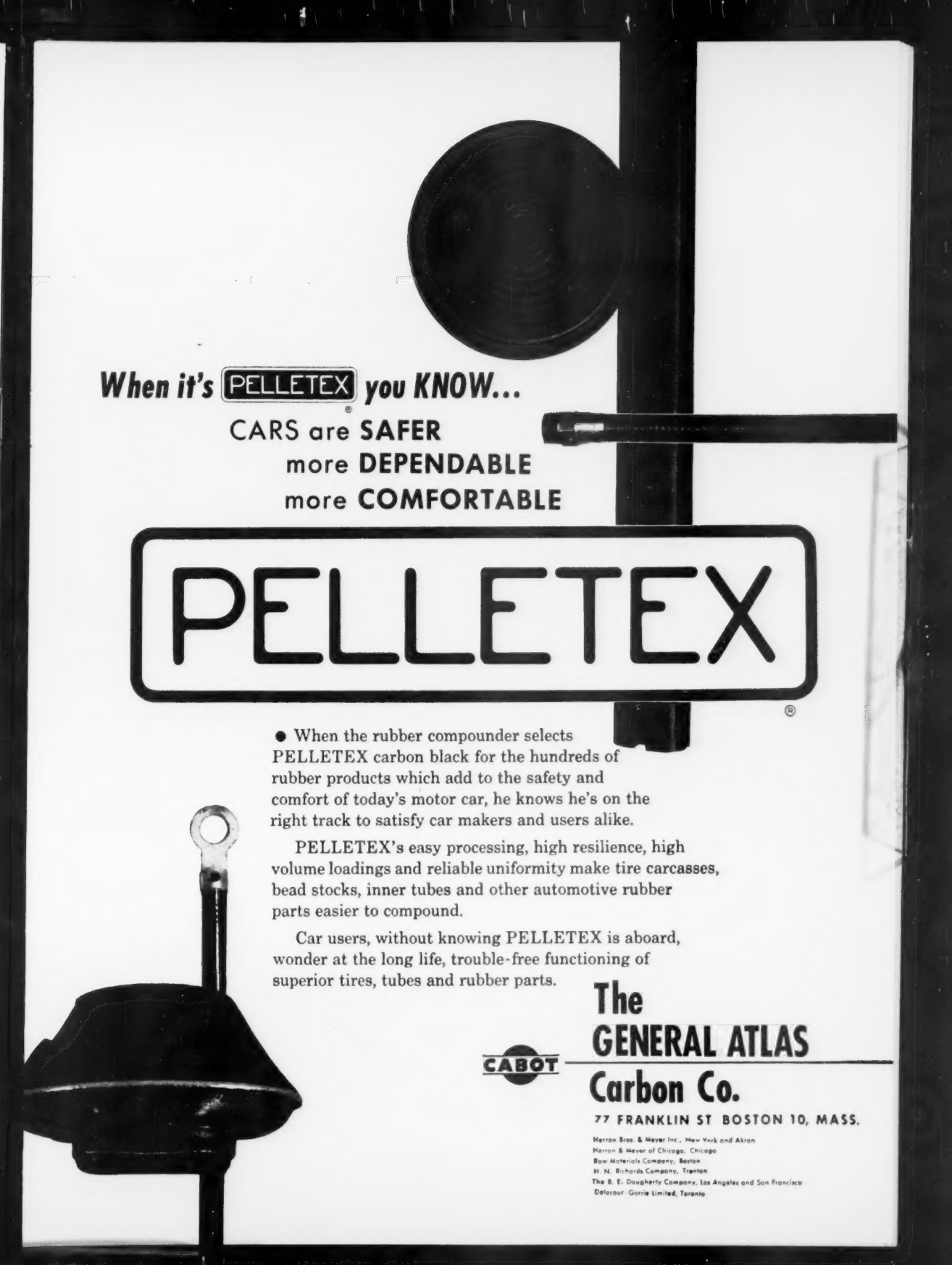
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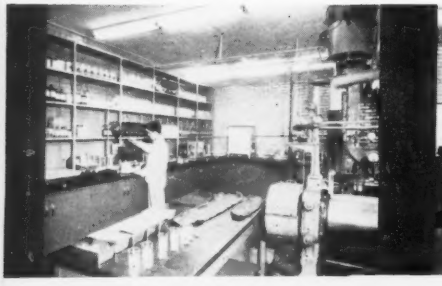
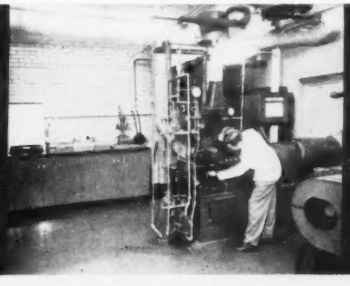
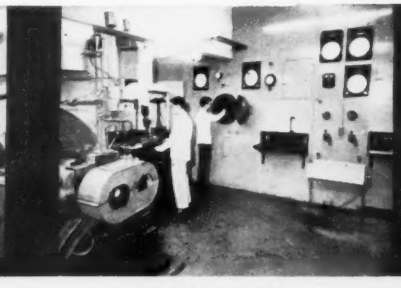


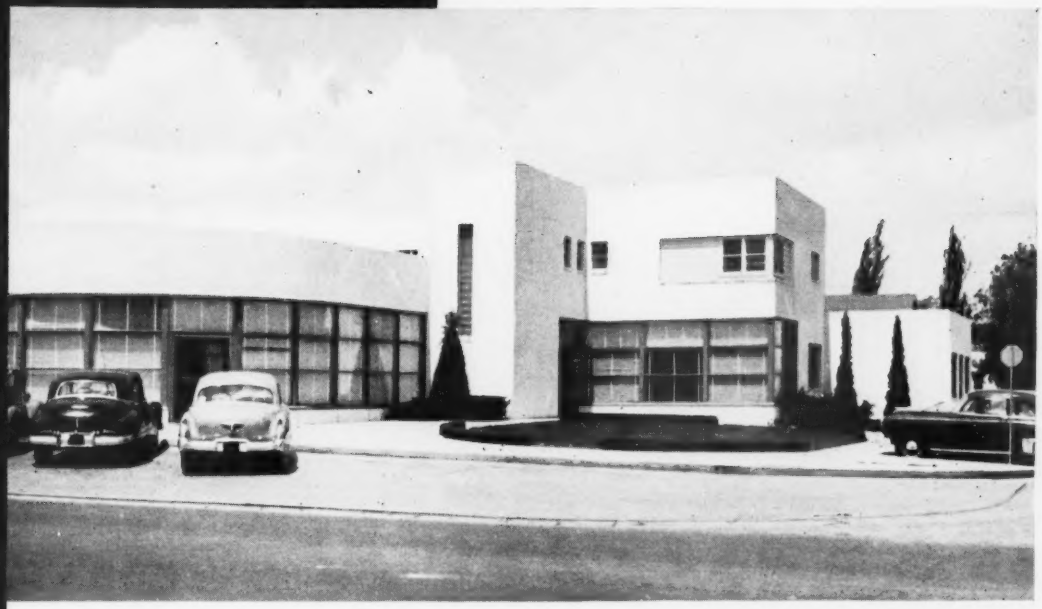
Sectional view of mill room showing compounding of rubber test batches.



Size "B" Banbury Mixer with temperature recorder. Mooney Plastometer in rear.



Sectional view of laboratory mill room showing: rubber mills, open steam vulcanizer, curing presses.



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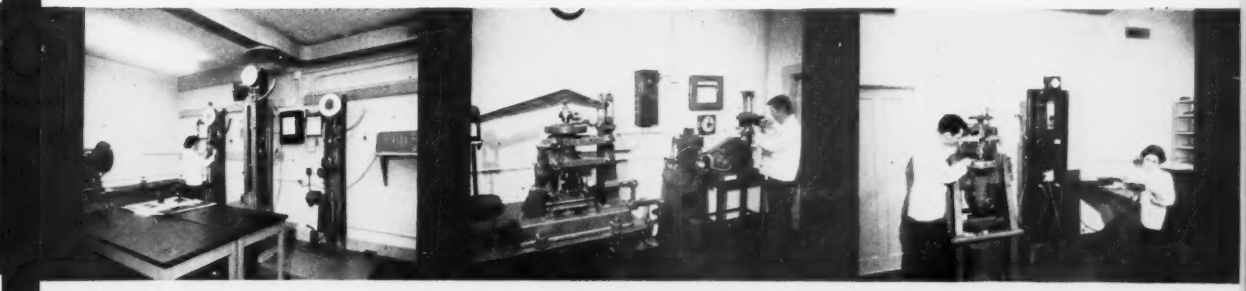

Scott Testers for evaluation of rubber compounds. Center machine for elevated temperature tests.

Sectional view of constant temperature-humidity test room showing St. Joe Flexometer, special type flexometer, DeMattia flexing apparatus.

Special type rubber compounds "Blow-out" machine. Lupke Rebound apparatus.

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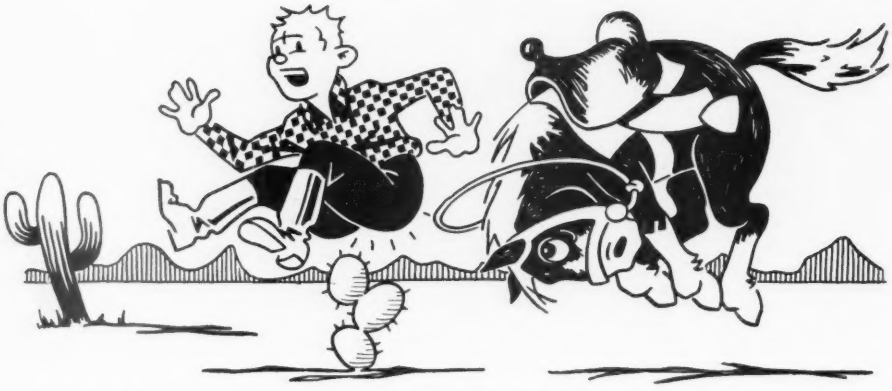

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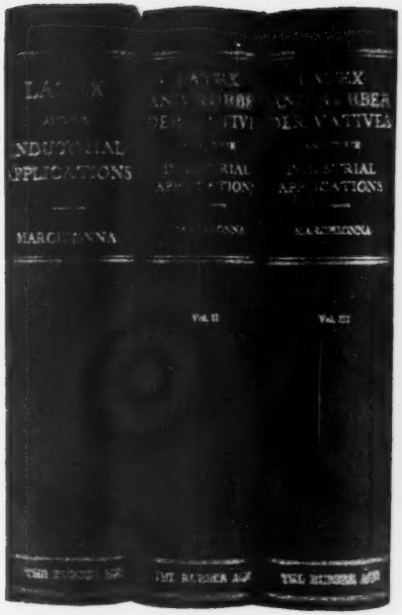

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RUBBER AGE

Vol. 69, No. 5 AUGUST, 1951

The Co-coagulation of Rubbers and Extenders

By FRITZ S. ROSTLER

Director of Research and Development, Golden Bear Oil Co., Oildale, California

THE possibility of extending rubber with low-cost and readily available petroleum products has again come to the fore in discussions in technical journals. Even the daily press and news magazines *(1)* have taken up the subject. Some of the reports, especially in the non-technical magazines, are, mildly speaking, inaccurate. Unfortunately, a certain undertone in these discussions makes it seem as if the matter were more of an issue under discussion than a technical problem to be solved. The argument, particularly regarding priority of invention, seems also to be going strong in England *(2, 3, 4, 5)*.

The author of this article, who took an early interest in the project of extending the rubber supply by appropriate compounding with petroleum products *(6)* and who, together with his co-workers, advocated at the outset of GR-S production that the feasibility of the extender approach through latex compounding should be investigated *(7, 8)*, will attempt with this paper to present his views regarding some of the aspects of the project and to give some references of interest. For the sake of brevity, only a portion of the available references are given here. It is hoped that this paper may somewhat clarify the situation and contribute to furthering the project, which, as now reported, is about to find large-scale application *(9, 10, 11, 12)*.

The two latest publications on the subject *(13, 14)* give valuable information, but a great deal of preceding work is not reported. Since this earlier work has not been made of public record, it is one purpose of this paper to fill this gap and possibly forestall duplication of work, as well as to present some new aspects. The main object of this paper is to assist in the selection of the most suitable oil for the oil-extended rubber.

Historical Background

Extenders from Petroleum: The usefulness of extenders made from petroleum for natural rubber and synthetic elastomers has been well established since 1936.* A number of compounds containing 70 parts of extender, and more, have been published *(16, 17)*. The first detailed report in American literature regarding this work was published in 1941 *(18)*. An extensive company publication preceded this article in July, 1940 *(19)*. That the value of this type of product was not generally recognized at that time can be seen from the review article of Tuttle *(20)*, who visualized the usefulness of the resinous fractions of petroleum, and was puzzled by the preference of the rubber industry for paraffinic hydrocarbons over naphthenic hydrocarbons.

The actual use of Naftolen-type products has been practiced extensively here and abroad from the beginning of the rubber shortage of the Second World War, and even earlier, for economic reasons. The introductory publications *(18, 19)*, which reported the manufacture and properties of Naftolen, also gave all basic compounding rules for this type of product and mentioned at the time the possibility of using this product as an extender for latex. A continuation of this report

* The author's interest in utilizing low-cost by-products of petroleum for use as extenders for rubber was referred to in American literature as early as 1935*(15)*.

(21) gave detailed information on compounding natural rubber: carbon black compounds with this extender. Series of compounds were given varying the amount of plasticizer-extender from 0 to 70 parts and the black from 0 to 200 parts. The next paper *(22)* in this series reported the usefulness of the product in compounding natural rubber and whole tire reclaim. The systematic compounding of natural rubber, GR-S, reclaim, black, and plasticizer was presented in the fourth installment *(23)* of this series of papers. The principle of maintaining hardness when compounding with plasticizers for extending purposes was repeated and shown applied in tire recipes in another paper *(24)*. Most literature on compounding techniques points out, especially with reference to extending the supply of rubber, that it is advantageous with high loadings of extenders of this type to use twice as much carbon black on the extender as is used for the rubber hydrocarbon *(16, 17, 18, 19, 21, 22, 23, 24, 25, 26)*.

A great number of other publications dealing with petroleum-based plasticizer-extenders can be found in the literature, which proves the considerable attention given this type of product *(25, 27, 28, 29, 30, 31, 32, 33, 34, 35)*.

Chronologically, Naftolen was the first product of this type used here and abroad; other products made from petroleum and advertised as such were Circo Light Process Oil *(36)*, Dutrex 6 *(37)* and Circosol 2XH *(38)*. Califlux 510, Califlux G. P., Califlux R-100 and Califlux 550 are products identical in composition with the Naftolens *(26)*. A great number of products of this type are now on the market, as can be seen from listings of current market prices in trade journals.

The great number of publications on the subject of extending the rubber supply with petroleum products shows that the practice has been well established and that various petroleum products have been recommended, tested, and used.

Compounding in the Latex Stage: It appears unnecessary to carry out an extensive literature search to support the statement that the basic idea of incorporating low-cost products into rubber in the latex stage, in itself, is not new either. Probably some of the earliest reports on india rubber could be interpreted to show that Columbus found the Indians using readily available material, such as bear's grease, to extend the latex to produce more playing balls for their children. However, apart from such references, it is good practice to consult the literature regarding past experience.

It is interesting to investigate what a standard reference book has to report on the subject. Marchionna *(39, 40, 41)* reports the following pertinent, early publications in form of abstracts.

Abstract No. 1306: " . . . carbon black is worked into a paste with water and small quantity of soap solution, and this paste is dispersed into the prepared latex; . . . The method enables to prepare mixings containing upwards of 50% dry rubber. . . . rubber latex paste . . . may be coagulated and worked into products." *(42)*

Abstract No. 1310: "Fillers . . . are added to latex in two stages. In the first stage the fillers, . . . are dispersed in the presence of a protective colloid, . . . and this dispersion is intermixed with latex, and the mixture may be coagulated or used in fluid form. In the second stage the fillers, which may be the same as those in the first stage mixing, or may be oxides of zinc, calcium and magnesium, are incorporated in the latex mixture in quantity sufficient to lower the anti-coagulant effect of the protective colloid; there is obtained in this process a crumb-like or a powdered coagulated mass . . . The coagulated crumbs can be used as master batch for compounding gas black into rubber." *(43)*

Abstract No. 2983: "A large quantity of a rubber softener . . . is combined with rubber by first emulsifying the plasticizer, adding the emulsion to the latex, and recovering the solid rubber-softener mixture which can be easily blended with fillers, pigments, etc., by milling. . . . a coagulum which can be used as a master batch for compounding a rubber mixing containing fillers, pigments, etc., but no plasticizer." *(44)*

Abstract No. 5273: "Bitumen, raw or boiled linseed or other oils, rosin oil, turpentine, etc., are emulsified in water by the use of rubber latex alone as the dispersing agent. . . . natural latex is heated . . . and run into a colloidal mill with . . . molten bitumen produced artificially from petroleum, . . . These mixed emulsions may be coagulated by any known method . . . " *(45)*

Abstract No. 2950: "Rubber softeners, such as pine tar, oleic or stearic acids, etc., are introduced in large quantity into rubber so as to make a master batch. . . . The softener, which is preferably used in the form of an emulsion, is incorporated into latex which is subsequently coagulated. . . . example . . . 40% pine tar and 60% rubber . . . a master batch which is then compounded with more rubber and the other desired compounding ingredients." *(46)*

Abstract No. 2953: "Hydrocarbon oils obtained from the cracking of petroleum having an initial B.P. of 350° F. or higher are used for treating rubber to soften and reclaim it. . . . The cracked petroleum is preferably either naphthenic or of asphaltic base. . . . These oils can be used also for treating rubber latex so as to effect a softening of the rubber globules in the latex . . . , after which the latex may be coagulated to produce a plasticized rubber stock." *(47)*

Abstract No. 2966: " . . . petroleum resins derived from the tarry decomposition residues of petroleum oils are excellent plasticizers and modifiers for rubber and rubber derivatives. Such resins are substantially free of asphaltene . . . can be incorporated in crude or reclaimed rubber, latex, rubber hydrohalides, sulfonated rubber, Duprene, etc. . . . stock containing the petroleum resin effects better milling of the rubber without sticking to the milling rolls." *(48)*

Many other publications give additional valuable information to be considered in connection with the co-coagulation process. A great number of publications refer to improvement of dry rubber which has been compounded in the latex stage. The following publications are typical, and show the growing interest in the subject.

R. G. R. Bacon, E. H. Farmer, and P. Schidrowitz *(49)* discussed as early as 1938 co-coagulates of rubber latex with resin emulsions and the value of this incorporation process.

H. F. O'Connor and C. W. Sweitzer *(50)* published a paper in February, 1944, discussing GR-S compounding in the latex stage. Carbon black dispersions are first prepared by ball-milling, and GR-S latex is then added to the black dispersion. The black-latex is diluted with water to about 12% rubber content and then gradually coagulated. The addition of softener in the emulsion stage for the purpose of reducing milling time is also mentioned in this paper. Superiority of the compounds made from coagulates to dry-mixed compounds is shown.

W. McMahon and A. R. Kemp *(51)* followed with a paper showing that thoroughness of dispersion of pigment in water is important to obtain physical properties better than those of identical compounds made on the

mill. Carbon black, zinc oxide, and calcium carbonate compounds are shown.

R. L. Rongone, C. B. Frost, and G. H. Swart *(52)* discuss the commercial method used by General Tire & Rubber Co. for adding carbon black to latex. This method uses a coarse black dispersion, and coagulation of the black and rubber is carried out by avoiding the creaming stage, which method is called "shock coagulation." Tests showed that physical properties are equal for stocks prepared by mill-mixing and for those in the latex stage.

J. J. Keilen and A. Pollak *(53)* found that the coprecipitation of lignin and GR-S shows that lignin is a reinforcing pigment for GR-S if added in the latex stage. The degree of reinforcement is compared to that of carbon black.

In a recent paper *(51)* J. J. Keilen, W. K. Dougherty, and W. R. Cook report how the separation of lignin: GR-S co-coagulates from the mother liquor (which has been the principal deterrent to producing lignin: GR-S co-precipitates commercially) can be improved.

For latex to be used as such, processing aids are, in general, a minor problem, and with natural rubber, since it cannot be reinforced in the latex stage, the object was quite different from the one of compounding GR-S in the latex stage. Even with natural rubber, however, compounding in the latex stage is preferable from the standpoint that milling of rubber for the purpose of plasticization results in a breakdown of the polymer molecules and the lowering of physical properties. Several methods of avoiding prolonged milling and high temperatures have been suggested. The use of chemical plasticizers such as furfural phenylhydrazone for GR-S *(55)* and *2,2'*dithiobisbenzanilide for GR-S and natural rubber *(56)* have been suggested. The addition of the latter to natural rubber in the latex stage has been discussed *(57)*, but the method of adding a chemical plasticizer is only aiming at quality improvement and does not consider the economy angle of extending the rubber hydrocarbons with material of low cost and ready availability. However, for quality reasons also, the advantage of compounding in the latex stage is greater with synthetic elastomers.

L. H. Howland, C. R. Peaker, and A. W. Holmberg *(58)* summarize these observations as follows: "Fillers, particularly carbon blacks, in GR-S latices have the unusual effect of producing reenforcement in contrast to their effect in natural rubber latex where they act only as diluents."

Inherent Weaknesses of Butadiene-Styrene Copolymers: A number of publications have dealt with the structural features responsible for the inherent weakness of copolymers. A few pertinent references illustrate these studies.

H. Mark *(59)* discusses the influence of degree of polymerization, chain length distribution, chemical nature, and structure on mechanical properties of high polymers. Regarding influence of low molecular weight constituents, it is stated: " . . . The shape of the distribution curve seems to have no definite effect on the ultimate strength except that a comparatively small amount (between 10 and 15 per cent by weight) of components having a polymerization degree below 150 are definitely detrimental to the mechanical properties of the sample."

A. R. Kemp and W. G. Straitiff *(60)* present data on the fractionations of a benzene-soluble type of Buna S and explain the inherent weakness of GR-S. Absence of crystallization is explained by lack of symmetry along polymer chains caused by uneven spacing of styrene units which are grouped together in some locations. Ineffectual cross-linking with sulfur during vulcanization due to unevenly spaced double bonds and wide chain separation is another cause for inherent physical weakness. It is explained that good physical characteristics of Buna S are obtainable only by reinforcement with pigment. Processing characteristics could be improved by narrower range of polymer sizes, eliminating the lowest molecular weight fractions, which vary in consistency from oils to taffylike substances.

L. M. White, E. S. Ebers, G. E. Shriver, and S. Breck *(61)* discuss the significance of the gel portion in relation to practical properties of GR-S. Carbon black present during plasticization reduces gel formation or disperses gel as fast as it is formed. It is pointed out that incorporation of black before plasticization may be either advantageous or detrimental, depending on whether maximum strength or ease of processing is the end objective.

B. L. Johnson *(62)* states that the low molecular weight portion of a polymer is detrimental as far as tire wear of GR-S and natural rubber compounds is concerned. However, it is further stated that full advantage of high molecular weight polymers could only be utilized if accompanied by structural changes which improve processability.

J. A. Yanko *(63)* studied nine fractions of GR-S obtained by precipitation, concluding that as the number-average molecular weight increases, better stress-strain and quality index data are obtained; however, processing becomes poorer.

The influence of milling and the difference in response to milling of GR-S and natural rubber has been investigated from many aspects. W. B. Wiegand and H. A. Braendle *(64)* show that "because of the shortness and tenderness of Buna S stocks under dynamic conditions," elongation falls off seriously as GR-S is overmilled.

A. Talalay and M. Magat *(65)*, after stating that "plastication and milling comprise mainly an oxidative degradation (depolymerization) of rubber," quote the following figures: molecular weight of good smoked sheet rubber—about 600,000, that of milled rubbers—about 140,000, and that of "dead" rubber—even below 50,000.

G. H. Piper and J. R. Scott *(66, 67)* emphasize the importance of uniform oxygen penetration into GR-S

About this article.....

Much discussion in the rubber manufacturing industry today centers on the potentiality of the so-called oil-extended or high Mooney viscosity synthetic rubbers. Articles outlining the processes developed by the General Tire & Rubber Co. and the Goodyear Tire & Rubber Co. have appeared in the rubber journals. Because of the current interest in the subject, we asked Dr. Rostler to prepare the present review which covers not only the published literature but much of the hitherto unreported early work. It is doubtful whether any rubber technologist is more qualified than Dr. Rostler to discuss the co-coagulation of rubbers and extenders. His own work in this field dates back to 1935 and he has closely followed the progress of others. His own approach to the problem is a matter of public record, as indicated in the extensive bibliography which accompanies this article. We feel that publication of this review material, is a definite contribution to the technical literature.—EDITOR.

during plastication and avoidance of unduly high temperatures during milling, especially in internal mixers, where lack of oxygen can cause scorching instead of plastication.

Co-Coagulation, an Alternative to Milling: The information available in the literature, briefly summarized, establishes that: In elastomers, high molecular weight polymers are responsible for high physical properties of the vulcanizates while the lower molecular weight degradation products produced during milling function as plasticizers and processing aids for the higher molecular weight components. When applied to the manufacture of synthetic elastomers by polymerization in emulsion, a logical conclusion from these facts is that emulsion polymerizates consisting predominantly of high molecular weight polymerization products, co-precipitated with lower molecular weight, compatible extenders are an economical and practical way of producing artificial elastomers industrially.

The problem of producing easy processing GR-S was attacked differently in England, since GR-S, not being produced there, is not available for improvement while in the latex stage. G. H. Piper and J. R. Scott *(66, 67)*, in their discussion of various methods of plasticizing above mentioned, also listed the soaking of thin sheets of GR-S in mineral oil. In discussing this process the authors concluded that this method would require too much oil to give the same plastic characteristics as are obtainable by cold-milling or hot-milling with a peptizing agent and that vulcanizates would have inferior mechanical properties. However, when the process had been discussed previously *(68)*, it was shown that GR-S with about 30 parts of mineral oil and 70 parts of channel black produces compounds with respectable physical properties. The advantage of soaking the GR-S in oil was pointed out to be that GR-S is not subjected to preliminary breakdown. It is now claimed by the inventor of the "oil technique" that it is the logical forerunner of the co-coagulation method *(5)*.

It is not surprising that various sides are laying claim to having been the first ones to develop the process of co-coagulating GR-S with extenders. It is undoubtedly true that work was carried out in various laboratories simultaneously and independently as is often the case with problems of timely interest, and various researchers probably arrived at the same or similar conclusions at the same time.

The credit for having realized the economic implications and of having given the process extensive publicity (and thus having speeded up the general acceptance of the idea) should go to the General Tire & Rubber Co.

Experimental Work on Co-Coagulation

The preceding pages have dealt with the chronological development of the process. Below will be given an account of the experimental work done by the author and his co-workers, which, as pointed out in the introduction, might contribute to furthering the process.

Preliminary Experiments with Natural Rubber Latex: The first attempt known to the author to test the feasibility of extending rubber hydrocarbons in the latex stage with the same petroleum products now recommended for the process was carried out in the laboratories of the University of Vienna in 1932, and in the laboratories of the Austro-American rubber works, Semperit. To test the procedure and the suitability of various extenders, natural rubber latex concentrate (Revertex) was used in the first tests. These experiments were later extended to German-produced Buna S and Buna N. The result of the preliminary investigations on co-coagulating plasticizers with rubbers in the latex stage was reported to the chemists of the Metal Corporation, Frankfurt AM, Germany, which had a license to the first German Naftolen patent *(69)*. A laboratory report on the work carried out in the Colloid-Chemical Laboratory of the Metal Corporation states, with reference to the work on extending natural rubber latex, that tensile strength values indicated that Naftolen is not to be considered a diluent of the rubber hydrocarbon since the values are about 70 kilograms per square centimeter higher than would be expected if it were to function like an inert filler *(70)*.

The difficulty at that time in obtaining synthetic latices caused the abandonment of the project by the author until it was resumed in the laboratories of Wilmington Chemical Corporation, Wilmington, Delaware.

Experimental Work with Synthetic Rubber: The work on co-coagulation, as continued in this country, was primarily concerned with synthetic rubber and especially with the problem of producing Buna S extended with petroleum products. Since the results of the work were reported for the most part in sources not readily available, it is the purpose of this article to make them available to those now interested in the problem or working in the field.

Previous Reports—In a summary article published in 1942 *(71)*, it is stated that the plasticizer, Naftolen, can be added in emulsified form to natural and synthetic latices, with which it is compatible in all proportions, imparting increased plasticity to the coagulate or film.

Two patent applications for the co-coagulation process were filed independently—one by the chemists of the Metal Corporation* and one by the author of this paper *(72, 73)*. The following two quotations from these patent applications show that the process of co-coagulating high Mooney GR-S with low-cost plasticizers from petroleum was well anticipated by these applications. In Patent Application, Serial No. 371,464, it is stated: "It has now been found, according to the invention, that by the joint coagulation of mixtures of synthetic rubber latices, or of dispersions of synthetic rubber derivatives, and of the emulsions of softening substances and by washing, drying and rolling, products are obtained that are adapted to a particularly high degree to serve as starting materials for the rubber industry. . . . In further accordance with the invention, the additional substances to be used comprise the extracts or distillates obtainable by refining mineral oils with selective solvents, as furfurole, sulfur dioxide, sulfur dioxide in mixture with organic solvents like benzene, etc., or from the acid tars produced in refining with concentrated sulfuric acid either after neutralization with suitable agents or by hydrolysis with water, water vapor, etc."

In Patent Application, Serial No. 471,474, Claims 1 and 2 as originally filed read as follows: "1—The method of producing plasticized synthetic rubber comprising preparing a mixed emulsion of a synthetic rubber and unsaturated hydrocarbon of the type derived from waste products of mineral oil refining and . . . co-coagulating the emulsion and removing the precipitated coagulate." "2—A plasticized synthetic rubber product comprising a co-coagulated emulsion of a synthetic rubber of the type which resists mastication, and an unsaturated hydrocarbon derived from the waste products of mineral oil refining. . . ."

Since the United States Patent Office took the point

* This patent was filed in spite of a written assurance that information given to the Metal Corporation would be kept confidential. Since all patents of the author were confiscated in Germany during the Second World War, the agreement was probably considered void.

of view that the process was anticipated by earlier patents and publications, which view is now fully shared by the author, the applications were abandoned, and are thus not generally available for reference.

Work on co-coagulating Buna S with extenders from petroleum was also reported in detail in two reports to the Rubber Director's Office *(7, 8)* with the suggestion that the process could be used to extend the rubber supply substantially. These reports were at that time confidential, and the results were, therefore, available only to a few members of the industry who cooperated in the work. A few quotations from the reports show that the problem and the approach to it were the same at that time as they are now:

"The purpose of this report is to present basic information on the compounding of WCC-Buna SW to those parties cooperating with us and the government in the evaluation of this modified Buna S type synthetic rubber." "The object of this cooperative investigation is to determine the desirability of the production of a Naftolen-modified Buna S that would serve the dual purpose of extending the basic copolymer and providing at the same time an easy-processing rubber, amenable to ordinary compounding technique." *(7)*

"The problem was approached from the standpoint that, since Buna S is a relatively tough co-polymer of hydrocarbons capable of being vulcanized with sulfur, it would be advantageous to add a modifying agent of a similar chemical nature, especially if that modifying agent were capable of imparting plasticity to the uncured rubber. Naftolen, the modifying agent used for this purpose, is an unsaturated hydrocarbon, and in rubber compositions reacts with sulfur in a manner that can best be described as covulcanization with the rubber. Consequently the plasticity imparted by Naftolen to the uncured rubber disappears after curing, and mixtures of Buna S and Naftolen may be regarded as a vulcanizable hydrocarbon basis for compounding. Such mixtures, therefore, can be compounded as 100% synthetic rubber." *(8)*

The last sentence, quoted verbatim from the report to the Rubber Director's Office, defines the aim as identical with the co-precipitation process being discussed at present.

Swart, Pfau and Weinstock *(13)* say, for instance, "In other words, the mixture of oil and high Mooney rubber can be considered and utilized as if it were all rubber."

The previous attempts *(7, 8)* to instigate the utilization of the co-coagulation process, made by the author of this paper and his co-workers, were unsuccessful. Two reasons were given by government agencies contacted for not utilizing the process at that time: (1) the pressing need for speedy standardization of a general purpose rubber, in the interests of the war effort, and (2) that a general purpose rubber containing a high amount of a certain plasticizer would present a limitation on developing compounds, in some of which different plasticizers, or no plasticizers, would be preferable. Perhaps ineffectual presentation of the process might in part also have been responsible for the process not having reached the industrial stage at that time.

On recommendations from the Rubber Director's Office, the work reported in the memoranda was extended to include a number of other laboratories, which laboratories reported their findings directly to the Rubber Director's Office.

Manufacture of Co-Coagulates—The data submitted to the Rubber Director's Office were based on two pilot-plant production runs made at Dewey and Almy Chemical Company, using 20 parts of plasticizer and 80 parts of a high viscosity Buna S. A number of laboratory batches containing various concentrations of extenders with this high viscosity Buna S were also prepared. The experimental details of this work are reported below in condensed form.

In a number of five-gallon pilot-plant runs and in two larger production runs it was established that the co-coagulation, as suggested, could easily be carried out in existing equipment. In neither of two test runs were any difficulties encountered nor was it necessary to deviate from the ordinary procedure of coagulating, drying or sheeting.

Table I—Compositions of Batches of Experimental Polymers, Made in November, 1942

Polymer:	Parts Plasticizer on 100 parts Buna S	% Buna S	% Plasticizer**
Buna S*	0	100	0
Buna SW-A	10	91	9
Buna SW-B	15	87	13
Buna SW-C	20	83.3	16.7
Buna SW	25	80	20

* The experimental Buna S was a copolymer of 30% styrene and 70% butadiene.
** Naftolen 510.

First Production of Plasticizer-Extended Buna S (Nov., 1942)

The first production of co-coagulates on larger-than-laboratory scale was made on the basis of these preliminary laboratory tests, which suggested that a blend of 80 parts elastomer and 20 parts plasticizer would be a practical proportion.

The Buna S latex for this run was produced at Dewey and Almy Chemical Company where the co-coagulation was carried out. The elastomer contained 30% styrene and 70% butadiene and was of considerably higher viscosity than GR-S. Polymerization yield totaled 5818 lbs. of Buna S latex with a solid content of 23.4%, which is equivalent to 1414 lbs. of synthetic rubber solids. The plasticizer used for the co-coagulates was Naftolen 510.* A 60% emulsion of the plasticizer, made with 0.6% of sodium oleate as emulsifying agent, was produced by Wilmington Chemical Corporation for this run. This relatively low viscosity plasticizer was chosen for this run because it was easy to emulsify. Of the 5818 lbs. of latex, 320 lbs. were used for the experimental co-coagulation runs while 2249 lbs. each were used for two larger batches—one with and one without the plasticizer. The large batch of elastomer-plasticizer co-coagulate contained 25 parts of Naftolen 510 on 100 parts of Buna S (80% Buna S and 20% Naftolen 510). The compositions and designations of the products made are shown in Table I.

Messrs. C. H. Egan, J. G. Mark, B. Dewey, Jr., and many others of the Dewey and Almy Chemical Company, who devoted a considerable amount of time to the work and gave advice freely from their experience in the field, were instrumental in making the process operative.

Second Production of Plasticizer-Extended Buna S (Jan., 1943)

The primary purpose of the second production run was to provide sufficient amounts of co-coagulate for

* This plasticizer is now available under the designation Califlux 510.

TABLE II—COMPOSITIONS OF BATCHES OF EXPERIMENTAL POLYMERS, MADE IN JANUARY, 1943

Polymer:	Parts Plasticizer on 100 parts Buna S2	% Buna S2	% Plasticizer**
Buna S2*	0	100	0
Buna SW2-A	5	95.2	4.8
Buna SW2-B	10	91	9
Buna SW2-C	25	80	20
Buna SW2-D	35	74	26
Buna SW2-E	50	66.7	33.3
Buna SW2-F	100	50	50

* The experimental Buna S2 was a copolymer of 30% styrene and 70% butadiene.
** Naftolen MV.

TABLE III—PROCESSING OF CRUDE POLYMERS ON MILL

Polymer	Composition (%) Buna S	Plasticizer	Passes required to form coherent sheet from crumbs	Minutes milling for banding of sheet
Buna S	100	0	4	4
Buna SW-A	91	9	1	2¾
Buna SW-B	87	13	1	2½
Buna SW-C	83.3	16.7	1	2
Buna SW	80	20	1	1¾
Smoked Sheets	Natural Rubber		—	2

testing by others. A number of small experimental batches were also prepared for testing the influence of various concentrations of plasticizer in the co-coagulate.

The second run was also made at Dewey and Almy Chemical Company; the copolymer used was the same stiff copolymer as that for the first run. The plasticizer used for the second run was Naftolen MV*, a plasticizer of higher viscosity than the Naftolen 510 used in the first run. Naftolen MV was used in all subsequent tests since it gave co-coagulates which were less sticky and of better physical properties. The emulsification equipment had by then been adjusted to handle this product of somewhat higher viscosity. The small experimental batches produced this time were of a wider range of plasticizer content, extended to 50:50 blends of elastomer and plasticizer. Compositions and designations of the batches are shown in Table II.

PROCESSING PROPERTIES OF CO-COAGULATES

Milling on the laboratory mill, plasticity measurements, and workability in the Banbury and the Gordon Plasticator were used to test processing properties.

In order to obtain a quick indication of the processability of the co-coagulates, the tests reported in Table III were made, using the materials produced in the first series of co-coagulates.

Plasticities were measured on the co-coagulates and on the straight elastomers made in both series of manufacturing test runs; these data are shown in Figures 1 and 2. The plasticity figures for the regular GR-S and the GR-S: plasticizer masterbatches taken from two previous publications *(74, 75)* are also shown for comparison.

The Scott instrument, rather than the Mooney, was used for these tests for the same reasons given in the previous paper *(74)* wherein the instrument and test method are described in detail. Swart et al *(13)* also reported having encountered difficulties with the Mooney instrument for this project.

Briefly described, the plastometer used was the Model P-1 with both platens flat *(76)*. Measurements were made at 212°F. in the platens and under a load of 15 lbs. Figures are reported as the compression in 0.001 inch of a cylindrical specimen 1-7/16 inches in diameter and 0.6 inch high, after 2½ minutes compression.

In Figure 1 are plotted the Scott plasticities as measured. In Figure 2 are plotted the values for relative compression, computed by subtracting from the Scott plasticity values the plasticities measured on the straight elastomers without plasticizer. It can be seen from Figure 1 that between 20 and 30 parts of the plasticizer-extender on 100 parts of the Buna S used were required to give a plasticity reading equal to that of the regular

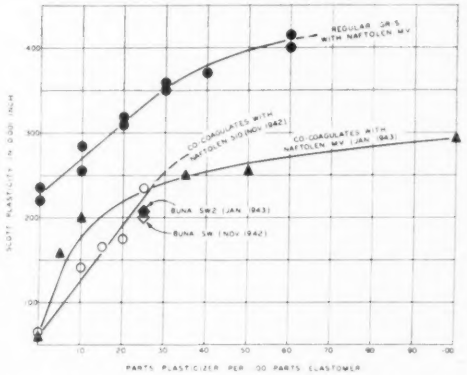
REGULAR GR-S WITH NAFTOLEN MV
CO-COAGULATES WITH NAFTOLEN 510 (NOV. 1942)
CO-COAGULATES WITH NAFTOLEN MV (JAN. 1943)
BUNA SW2 (JAN. 1943)
BUNA SW (NOV. 1942)
SCOTT PLASTICITY IN 0.001 INCH
PARTS PLASTICIZER PER 100 PARTS ELASTOMER

FIG. 1—Comparison of measured plasticity values.

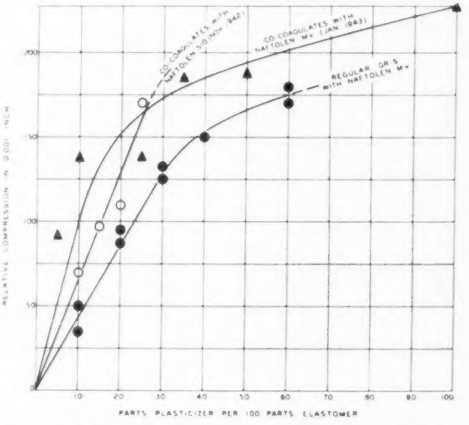
CO-COAGULATES WITH NAFTOLEN 510 (NOV. 1942)
CO-COAGULATES WITH NAFTOLEN MV (JAN. 1943)
REGULAR GR-S WITH NAFTOLEN MV
RELATIVE COMPRESSION IN 0.001 INCH
PARTS PLASTICIZER PER 100 PARTS ELASTOMER

FIG. 2—Comparison of computed relative plasticities.

* Califlux G. P. is the commercially-available plasticizer identical in composition with Naftolen MV.

TABLE IV—COMPARISON OF POWER CONSUMPTION OF EXPERIMENTAL POLYMERS AND SMOKED SHEETS IN BANBURY

Time (Minutes)	Horsepower Consumption			Horsepower Consumption Expressed in % of Horsepower Consumption of Smoked Sheets			Batch Temperature of		
	Buna S2	Buna SW2	Smoked Sheets	Buna S2	Buna SW2	Smoked Sheets	Buna S2	Buna SW2	Smoked Sheets
1	6.6	3.9	5.7	116	68	100			
2	6.0	3.6	4.5	133	80	100			
2½	——	——	4.2	——	——	——	305	280	350
3	6.3	3.3	3.9	162	85	100			
4	5.4	3.0	3.6	150	83	100			
5	5.1	2.7	3.3	155	82	100	390	310	405
6	4.2	2.7	2.7	155	100	100			
7	3.6	2.4	2.4	150	100	100			
7½	——	2.4	2.4	——	100	100	425	315	440
9	Cooling Period from 7½ to 9 minutes with Banbury Speed Reduced to 80.8 r.p.m.						305	250	290

GR-S. It can also be seen from this figure (and still better from Figure 2), when comparing the curves for the same plasticizer with different elastomers and the curves for different elastomers with the same plasticizer, that the plasticizer component, as well as the elastomeric component, has a distinct influence on this property of the co-coagulate.

The workability of the co-coagulate containing 20% of plasticizer was tested in the laboratories of Farrel-Birmingham Co., Inc., in Derby, Connecticut. A description of the facilities of their laboratories has been reported elsewhere *(77)*. The tests were carried out with the most helpful cooperation of Messrs. D. A. Comes, C. Schnuck, and H. Brewster of that firm in the presence of the author, at that time chief chemist of Wilmington Chemical Corporation, and of E. V. Osberg, at that time sales manager of Wilmington Chemical Corporation.

Test runs were made in a Banbury and in a Gordon Plasticator. The polymers compared were the Buna S2 (Jan., 1943), the Buna SW2 containing 20% plasticizer, and smoked sheets. In Table IV are reported the tests made in the Banbury Mixer. A size B Banbury was used, operated at 119 rpm with a charge of 2¾ lbs. of polymer. No cooling water was used until after breakdown. Horsepower values shown are total horsepower consumed minus horsepower consumed by the Banbury running empty.

In Table V are reported results obtained on tests performed with the Gordon Plasticator under the direction of Mr. Gordon. The object of these tests was to compare power consumption, material output, and heat development. No attempt was made to obtain an actual plasticated polymer as in the Banbury Mixer. The data in Table V confirm the results obtained in the Banbury in respect to lower power consumption and lower heat development in the mastication of Buna SW.

From these data it can readily be seen that the incorporation of 25 parts of a suitable plasticizer-extender on 100 parts of a stiff elastomer markedly reduces the power required for mastication. The data show that the co-coagulate was even easier-processing than smoked sheets and compared favorably as to heat development.

INFLUENCE OF AMOUNT OF PLASTICIZER ON PHYSICAL PROPERTIES OF VULCANIZATE

In order to provide some general information on the compounding of the co-coagulates to the laboratories cooperating on the evaluation of it, a great number of compounding studies were made. Below are reported some of the data.

Two series of compounds reported in Tables VI and VII illustrate the compounding properties of the co-coagulates. Table VI reports data on the polymers made in the first run (Nov., 1942) tested in a formula containing 52 MPC black. Sulfur was adjusted in accordance with the demand of the polymers for optimum properties. It had been determined in preliminary tests that for the series of polymers produced at that time the optimum amount of sulfur was 1.25 for the Buna S and 1.5 for the Buna SW, which indicates a sulfur demand of the plasticizer of 2.5%. In Table VII is reported a series of compounds in which the increased carbon black demand of the co-coagulates containing the plasticizer was taken into account. In Table VIII is given for comparison a test series made with a regular Buna S on the market at that time.

INFLUENCE OF PLASTICIZER ON DISPERSION OF FILLERS

In connection with compounding co-coagulates, the question is sometimes raised whether a soft hydrocarbon matrix containing high amounts of plasticizer will give

TABLE V—COMPARISON OF BUNA S AND BUNA SW WITH SMOKED SHEETS IN GORDON PLASTICATOR

Plasticator Operating Conditions	Pass	Buna S			Buna SW			Smoked Sheets		
		Total Horsepower	Max. Temp.	Output lbs./hr.	Total Horsepower	Max. Temp.	Output lbs./hr.	Total Horsepower	Max. Temp.	Output lbs./hr.
Die Temp., 300° F. Head Temp., 215° F. Cylinder and Screw Temp., 175° F. Screw Speed, 150 r.p.m.	First	30	300	420	17	250	440	17	——	240
	Second	25	350	370	17	270	435	14	——	300

TABLE VI—BUNA S CO-COAGULATED WITH INCREASING AMOUNTS OF PLASTICIZER—SERIES WITH CONSTANT BLACK LOADING

Compound No.	1	2	3	4	5
Buna S	100.	—	—	—	—
Buna SW-A	—	100.	—	—	—
Buna SW-B	—	—	100.	—	—
Buna SW-C	—	—	—	100.	—
Buna SW	—	—	—	—	100.
Stearic acid	0.50	0.50	0.50	0.50	0.50
Zinc oxide	5.	5.	5.	5.	5.
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25
MPC black	52.	52.	52.	52.	52.
Sulfur	1.25	1.35	1.40	1.45	1.50
Benzothiazyl disulfide	1.50	1.50	1.50	1.50	1.50
Plasticizer in Co-Coagulate (%)*	(0)	(9)	(13)	(16.7)	(20)
Optimum cure at 45#	60′	20′	20′	20′	20′
Shore A hardness (30 sec.)	64	57	56	56	54
Modulus at 300% (psi)	2040	940	930	960	890
Modulus at 500% (psi)	—	1980	1980	1990	1900
Tensile at break (psi)	3100	3310	2830	2860	2530
Elongation at break (%)	410	650	660	650	610
Set at break (%)	10	23	28	29	28
Batch temperature (°F.)					
After breakdown	140	120	120	125	120
After carbon black addition	160	155	150	150	145
Tensile × elongation × 10^{-4}	127	215	187	186	154

* Naftolen 510 used.

as good black dispersion as is obtained in conventional mixing procedure.

It has been shown in previous publications that high amounts of plasticizer-extenders can be masterbatched with natural rubber as well as synthetic rubbers without interfering with dispersion of fillers *(19, 24)*. These previous findings were confirmed by mixing compounds of the composition given in Table VII in conventional manner, i.e., by incorporating the greater part of the black before incorporating the plasticizer. The physical test data of the compounds were the same as the data in Table VII within the experimental error, proving that filler dispersion did not suffer regardless of what amounts of plasticizer and filler were co-coagulated or pre-mixed with the polymer.

Regarding filler dispersion, it has been pointed out from the very beginning of compounding with plasticizers and extenders that the only important precaution is that filler and plasticizer should not be added to a mix simultaneously *(18)* except when certain limits of proportions, depending on the type of plasticizer as well as on the type of black, are observed *(74, 75)*. In general it appears to be good compounding practice to masterbatch plasticizer and polymer, regardless of whether it is done in the dry stage or in the latex stage.

A compounding study made in the Philblack Sales Service Laboratories in Akron, Ohio, as to whether these findings also apply to low-temperature polymers is interesting in this respect since it can be seen from this study *(78)* that masterbatching of the low-temperature polymer and the plasticizer-extender did not impair

TABLE VII—BUNA S CO-COAGULATED WITH INCREASING AMOUNTS OF PLASTICIZER — SERIES WITH INCREASED BLACK LOADING

Compound No.	1	2	3	4	5	6	7	8
Buna S2	100.	—	—	—	—	—	—	—
Buna SW2-A	—	100.	—	—	—	—	—	—
Buna SW2-B	—	—	100.	—	—	—	—	—
Buna SW2	—	—	—	100.	—	—	—	—
Buna SW2-C	—	—	—	—	100.	—	—	—
Buna SW2-D	—	—	—	—	—	100.	—	—
Buna SW2-E	—	—	—	—	—	—	100.	—
Buna SW2-F	—	—	—	—	—	—	—	100.
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Zinc oxide	5.	5.	5.	5.	5.	5.	5.	5.
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
MPC black	45.	47.60	50.	54.20	56.	59.30	63.30	72.50
Sulfur	1.	1.10	1.18	1.33	1.40	1.52	1.67	2.
Plasticizer in Co-Coagulate (%)*	(0)	(4.8)	(9)	(20)	(20)	(26)	(33.3)	(50)
Optimum cure at 45#	65′	35′	50′	50′	65′	65′	50′	35′
Specific gravity	1.155	1.170	1.175	1.195	1.205	1.215	1.230	1.270
Shore A hardness (30 sec.)	60	56	59	61	60	63	62	66
(Aged 7 days Geer Oven)	66	63	65	65	66	67	70	78
Modulus at 300% (psi)	1300	850	1130	1260	1140	1200	1160	1260
Modulus at 500% (psi)	3040	1850	2640	2860	2540	2530	2320	—
Tensile at break (psi)	3040	2460	3020	3180	3050	2570	2490	1970
(Aged 7 days Geer Oven)	2780	2020	2910	2910	2610	2620	2370	1840
Elongation at break (%)	500	610	560	530	570	500	530	430
(Aged 7 days Geer Oven)	380	480	440	460	470	460	440	320
Set at break (%)	11	17	15	16	22	22	34	58
Abrasion, DuPont Abrader (cc. loss per h.p. hr.)	22	69	62	118	86	104	135	402
Shore A hardness, block	64	57	60	60	61	59	62	67
Tear resistance (lb./in.)								
Lengthwise	400	410	400	500	450	390	410	290
Crosswise	270	440	430	460	470	390	450	390
Luepke resilience—								
1st impact	65	60	60	55	50	48	44	35
4th impact	19	15	14	10	8	7	5	3
Tensile × elongation × 10 *	152	150	169	168	174	128	132	85

* Naftolen MV used.

TABLE VIII—COMMERCIAL BUNA S COMPOUNDED WITH INCREASING AMOUNTS OF PLASTICIZER — SERIES WITH INCREASED BLACK LOADING

Compound No.	1	2	3	4	5	6	7	8
Buna S—Goodyear	100.	95.2	90.90	83.30	80.	74.	66.6	50.
Plasticizer-Extender*	——	4.8	9.10	16.70	20.	26.	33.4	50.
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Zinc oxide	5.	5.	5.	5.	5.	5.	5.	5.
Benzothiazyl disulfide	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Diphenylguanidine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
MPC black	45.	47.60	50.	54.20	56.	59.30	63.30	72.50
Sulfur	1.80	1.85	1.92	2.00	2.04	2.11	2.20	2.40
Optimum cure at 45#	65′	50′	50′	65′	65′	65′	80′	**
Specific gravity	1.145	1.160	1.170	1.185	1.195	1.210	1.225	**
Shore A hardness (30 sec.)	60	59	60	62	64	65	65	**
(Aged 7 days Geer Oven)	66	67	68	69	70	71	75	**
Modulus at 300% (psi)	1530	1290	1190	1260	1160	1200	1150	**
Modulus at 500% (psi)	3130	2880	2720	2700	2570	2490	2280	**
Tensile at break (psi)	2980	3160	3000	2830	2850	2520	2400	**
(Aged 7 days Geer Oven)	2480	2840	2420	2510	2510	2370	2240	**
Elongation at break (%)	470	530	530	510	540	500	510	**
(Aged 7 days Geer Oven)	350	420	350	390	390	400	400	**
Set at break (%)	11	14	17	19	24	27	36	**
Abrasion, DuPont Abrader (cc. loss per h.p. hr.)	16	18	53	63	90	109	Smeared	**
Shore A hardness, block	58	60	60	61	62	63	——	**
Tear resistance (lb./in.)								
Lengthwise	320	390	390	400	420	320	310	**
Crosswise	330	390	390	350	430	340	420	**
Luepke resilience—								
1st impact	59	53	57	63	49	46	43	**
4th impact	13	9	12	17	7	6	5	**
Tensile × elongation × 10^{-4}	140	167	159	144	154	126	122	

* Naftolen MV used.
** Too soft to mix.

filler dispersion. With the permission of Phillips Chemical Company, the data from this report are given in Table IX.

Raw Materials for the Co-Coagulation Process

The above-discussed work was carried out with a few selected polymers and plasticizers and deals primarily with the feasibility of the process. For industrial application, details and practical aspects become of predominant importance, especially the question of raw materials. The following portion of this article will deal with the raw material question.

It is obvious that in any process employing two components, each of which has its part in influencing the final properties, both components must be carefully chosen. As to the elastomeric component, it appeared from the beginning desirable that a high viscosity GR-S, free of low molecular weight fractions, should be used. Extensive literature exists which gives valuable information regarding the chemical and physical makeup of the elastomeric component, as has been shown in references cited *(59, 60, 61, 62, 63)*.

Selection of Plasticizers: The chemistry of elastomers to be co-coagulated with the "oil" has been most rigorously scrutinized also in connection with the co-coagulation process, but the "oil" has scarcely been investigated. The author believes that manufacturers' descriptions and classifications of plasticizers, accompanied by a few physical constants, are insufficient for identification and that they do not aid in the understanding of how these products function. Comparing the information available, the approach to choosing the two components of the oil-rubber co-coagulate is at present completely out of balance, and the situation appears badly in need of change. It is the purpose of the following pages of this paper to contribute a starting point for a sound chemical approach to the problem of extender selection.

METHODS OF DEFINING AND SELECTING PETROLEUM OILS

In choosing a suitable extender for the oil-extended rubber, the following points can be considered of importance:

Chemical makeup of the extender;
Compatibility of the extender with the elastomer;
Permanency of the extender;
Influence of the extender on processability;
Influence of the extender on the physical properties of the vulcanizate;
Influence of emulsification of plasticizers on properties of the co-coagulate;
Availability and economic and political aspects.

Chemical Makeup of the Extender:

An understanding of the basic chemistry of extenders for rubber from petroleum is by far the best guide to choosing the proper product. Unfortunately, the composition of petroleum products containing chemical compounds of more than a few carbon atoms is so complex that any attempt to identify individual hydrocarbons is a futile task. This eliminates beforehand the possibility of applying classic organic chemistry to the problem. To know this limitation is the first requirement for attacking the problem correctly.

Present Methods of Defining Petroleum Oils: It must be realized (and this is important to every rubber chemist working in this field) that most chemical definitions and classifications at present applied to petroleum products of higher boiling range are based on analogies and extrapolations of physical characteristics and not

TABLE IX—COMPARISON OF PRE-MASTERBATCHING WITH CONVENTIONAL MIXING

Compound No.	25—PB—21				25—PB—25				25—PB—22				25—PB—26			
LTP	100.				100.				100.				100.			
Califlux TT	10.				10.				21.				21.			
Philblack O	50.				50.				60.				60.			
Zinc oxide	5.				5.				5.				5.			
BLE powder	1.				1.				1.				1.			
Stearic acid	2.				2.				2.				2.			
Santocure	1.25				1.25				1.25				1.25			
Sulfur	1.75				1.75				2.00				2.00			
Mixing Procedure	LTP & Califlux TT Masterbatched 24 hrs. Before Mixing				Conventional Mixing				LTP & 16 Califlux TT Masterbatched 24 hrs. Before Mixing				Conventional Mixing			
Mooney viscosity																
ML, 1½ min., 212° F.	63				65				56				57			
ML, 4 min., 212° F.	57				59				51				53			
Mooney scorch, MS, 265° F. (min.)	32				33				30+				30+			
Cure at 45 lbs. (min.)	20	30	45	60	20	30	45	60	20	30	45	60	20	30	45	60
Shore A hardness																
Initial	56	60	61	61	57	60	61	62	57	60	62	63	57	61	61	63
Aged 48 hrs., 212° F.	68	67	67	67	69	68	67	67	69	70	69	68	68	69	69	69
Modulus at 200% (psi)																
Aged 48 hrs., 212° F.	1540	1640	1520	1430	1720	1750	1620	1480	1630	1710	1600	1490	1790	1780	1760	1600
Modulus at 300% (psi)—Initial.	760	1320	1510	1520	850	1340	1540	1660	810	1330	1520	1575	910	1430	1650	1710
Tensile at break (psi)																
Initial	2720	3000	3220	3400	2880	3400	3500	3520	2590	2590	3100	2900	2600	3180	3100	3340
Aged 48 hrs., 212° F.	2700	2800	2900	3100	2780	2810	2900	2650	2400	2800	2700	2470	2700	2780	2580	3000
Elongation at break (%)																
Initial	735	540	515	515	685	590	545	525	735	475	535	475	650	545	490	520
Aged 48 hrs., 212° F.	300	290	320	350	280	285	300	305	270	300	280	265	280	290	275	330
Goodrich Flexometer data, 100° F., 143 psi, 17.5% compression																
Temperature rise (° F.)	56		55		55.5		55		58		59		60		60	
Dynamic compression (%)	1.97		1.34		1.94		1.28		2.27		1.96		1.79		1.51	
Permanent set (%)	2.22		1.91		2.21		1.51		2.67		2.51		2.66		2.06	
Compression set, ASTM Method B (%)	24.2		18.7		24.3		17.6		24.7		18.7		24.6		17.5	
Shore A hardness—block	59		59		59		59		60		59		60		60	
Luepke rebound	48		48		49		48		41		41		42		43	
De Mattia flex life (M flexures) 210° F., 2¼ in. stroke, 300 rpm.	28.7		10.0		35.8		27.2		50.1		26.5		27.5		28.8	
Angle abrasion (cc. loss) 11° angle, 32 lb. load, 1600 revs.	2.45		2.22		2.30		2.22		2.08		1.97		2.06		1.94	
Specific gravity	1.151				1.153				1.162				1.168			

on actual determinations or identifications of the chemical compounds whose names are borrowed in order to define the products.

Functional terms, such as process oils, extenders, reclaiming oils, etc., are descriptive of the purpose for which the products are recommended but not of their composition. The names paraffinic oils, naphthenic oils, and aromatic oils are loosely used, and hardly ever is an attempt made to provide evidence for this nomenclature. Viscosity index, viscosity-gravity constant, and other conventional characteristics used are not specific for any of the hydrocarbon types. Aniline point and refractive index of high-boiling petroleum products, because of the complexity of their composition, are also completely valueless.

With petroleum products in the boiling range of gasoline or lower, it is possible to identify individual components by making close fractional distillations and measuring such structural characteristics as refractive index, infra-red absorption, etc., since narrow fractions in the low boiling range contain only a few hydrocarbons of known chemical structure. With high boiling petroleum products, the narrowest fractions of which ever produced still contain many thousands of isomers*, such interpretations on the basis of additivity of structural characteristics is meaningless. This is especially true of the products used and recommended as extenders for rubber since these products are not even the lubricating oil fractions usually investigated and for which analogies have been set up. The products recommended and used as extenders for rubber consist almost completely, or contain appreciable amounts, of resinous petroleum products which are entirely different from any hydrocarbon mixtures with which classic organic chemistry deals.

Thus, all existing classifications and so-called identifications of oils by physical constants could at best be called working hypotheses for which no experimental proof exists at present; in fact, they are confusing rather than enlightening since they imply certain properties of structural configurations not necessarily present in the products.

Suggested Method of Defining Petroleum Oils: Since petroleum products used by the rubber industry are practically the only group of materials left for which strict chemical specifications are not in force, there is a definite need to eliminate this situation which is out of step with the progress otherwise made in the rubber industry with respect to raw material specifications. Some efforts have been devoted by the author and his coworkers toward achieving this aim.

* The saturated hydrocarbon tetradecane ($C_{14}H_{30}$) has 1855 isomers.

TABLE IX—CONTINUED

Compound No.	25—PB—23				25—PB—27				25—PB—24				25—PB—28			
LTP	100.								100.							
Califlux TT	26.								31.							
Philblack O	65.								70.							
Zinc oxide	5.								5.							
BLE powder	1.								1.							
Stearic acid	2.								2.							
Santocure	1.25								1.25							
Sulfur	2.06								2.13							
Mixing Procedure	LTP & 16 Califlux TT Masterbatched 24 hrs. Before Mixing				Conventional Mixing				LTP & 16 Califlux TT Masterbatched 24 hrs. Before Mixing				Conventional Mixing			
Mooney viscosity																
ML, 1½ min., 212° F.	55				55				54				51			
ML, 4 min., 212° F.	49				50				49				47			
Mooney scorch, MS, 265° F. (min.)	30+				30+				30+				32			
Cure at 45 lbs. (min.)	20	30	45	60	20	30	45	60	20	30	45	60	20	30	45	60
Shore A hardness																
Initial	59	61	63	64	57	61	62	63	58	62	64	65	57	60	62	63
Aged 48 hrs., 212° F.	69	71	71	70	69	69	68	68	71	71	71	71	71	69	69	69
Modulus at 200% (psi)																
Aged 48 hrs., 212° F.	1610	1760	1610	1530	1780	1720	1660	1510	1640	1790	1660	1590	1590	1610	1670	1580
Modulus at 300% (psi)—Initial.	880	1420	1590	1610	810	1280	1560	1660	860	1390	1580	1660	810	1300	1540	1590
Tensile at break (psi)																
Initial	2460	2980	3010	3170	2410	2800	2950	2780	2380	2700	2900	2940	2400	2740	2800	2960
Aged 48 hrs., 212° F.	2490	2700	2600	2900	2600	2750	2540	2630	2430	2780	2800	2750	2700	2840	2910	2500
Elongation at break (%)																
Initial	685	565	500	525	665	575	490	475	730	555	520	510	690	560	485	510
Aged 48 hrs., 212° F.	280	290	295	350	275	295	280	310	280	280	315	325	330	330	325	285
Goodrich Flexometer data, 100° F., 143 psi, 17.5% compression																
Temperature rise (° F.)	62.5	62			60.5	61			65.5	64.5			63	62		
Dynamic compression (%)	2.63	1.76			1.94	1.42			2.45	2.05			2.40	1.66		
Permanent set (%)	3.22	2.56			3.02	2.41			2.66	3.11			3.82	2.71		
Compression set, ASTM Method B (%)	25.0	18.0			25.2	18.5			24.6	17.9			25.9	18.9		
Shore A hardness—block	59	59			59	60			60	59			59	60		
Luepke rebound	39	40			40	41			37	38			38	37		
De Mattia flex life (M flexures) 210° F., 2¼ in. stroke, 300 rpm.	69.0	35.8			40.1	14.8			24.4	6.7			11.5	11.2		
Angle abrasion (cc. loss) 11° angle, 32 lb. load, 1600 revs.	1.93	1.88			2.00	1.92			1.84	1.87			1.94	1.82		
Specific gravity	1.168				1.169				1.179				1.179			

Two previously published papers *(79, 80)* reported the work which led to developing a quantitative analysis for determining five basic groups of components which govern the behavior of petroleum products as compounding ingredients for rubber. The groups were defined as:

Asphaltenes, components precipitable by *n*-pentane.

Nitrogen bases, components precipitable by sulfuric acid, 85% H_2SO_4 content, which precipitate contains all the nitrogen of the sample.

Unsaturated hydrocarbons I (also called *first acidaffins)*, components precipitable by sulfuric acid, 97 to 98% H_2SO_4 content.

Unsaturated hydrocarbons II (also called *second acidaffins*), components precipitable by fuming sulfuric acid, containing 30% SO_3.

Saturated hydrocarbons (paraffins), not affected by fuming sulfuric acid in the cold.

The designations, "1st acidaffins" and "2nd acidaffins," which will be used in this paper, are, and have been for many years, used by the author and his co-workers in laboratory records to express that these groups are defined by their degree of affinity to sulfuric acid. This is in accordance with the classic name of paraffins [with the sub-groups of straight chain paraffins, branched chain paraffins *(iso*-paraffins), and cycloparaffins] for the group of hydrocarbons which has the least affinity (L. *parum affinis*) for sulfuric acid.

The advantage of this method of group analysis *(80)* lies principally in the fact that it is a reproducible, quantitative analysis in which groups of components are isolated on the basis of their reactivity to certain reagents and that these groups can be, and have been, isolated and individually tested as to their performance in rubber. Since properties of the components are additive, prediction of performance of products can be made on the basis of the analytical data. The method does not prove or suggest any chemical structures, but does offer an understanding of why and how the products analyzed function.

Compatibility of the Extender with the Elastomer:

As to the compatibility of the extender with the elastomer, it was shown early in laboratory compounding work and in practical use that the plasticizer-extenders from petroleum, such as Califlux, which contain a high amount of unsaturated components, are compatible with practically all elastomers in practically all proportions, and give results excellently reproducible if their compositions are controlled within certain limits.

Compatibility of a plasticizer from petroleum with a

TABLE X—COMPARISON OF ASPHALTENE-EXTENDED GR-S COMPOUNDS WITH STRAIGHT GR-S COMPOUNDS

Compound No.	1	2	3	4	1a	2a	3a	4a
GR-S	100.	100.	100.	100.	100.	100.	100.	100.
Sulfur	3.	3.	3.	3.	3.	3.	3.	3.
Stearic acid	1.	1.	1.	1.	1.	1.	1.	1.
G. B. Asphaltenes	—	—	—	—	40.	40.	40.	40.
MPC black	—	10.	30.	55.	—	10.	30.	55.
Zinc oxide	5.	5.	5.	5.	5.	5.	5.	5.
Benzothiazyl disulfide	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Optimum cure at 60#	65'	50'	50'	50'	45'	50'	50'	50'
Shore A hardness (30 sec.)	48	54	64	76	56	56	68	74
Modulus at 300% (psi)	—	630	1750	—	840	530	750	840
Modulus at 500% (psi)	—	—	—	—	980	950	1530	1720
Tensile at break (psi)	200	710	1750	2940	1200	1420	2000	2400
Elongation at break (%)	250	310	300	370	400	600	590	600

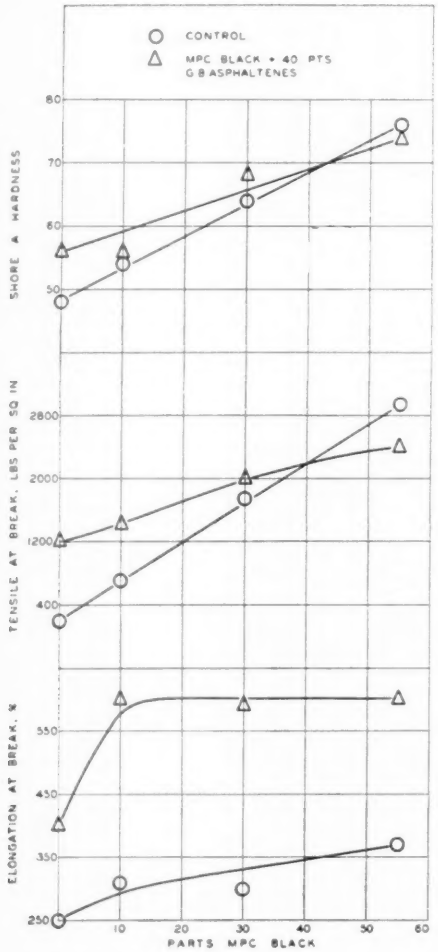
CONTROL
MPC BLACK + 40 PTS G B ASPHALTENES
SHORE A HARDNESS
TENSILE AT BREAK, LBS PER SQ IN
ELONGATION AT BREAK, %
PARTS MPC BLACK

FIG. 3—Comparison of asphaltene-extended GR-S compounds with straight GR-S compounds.

polymer is a matter of mutual solubility. Similarity in structural configuration, which makes the plasticizer fit into the lattice of the polymer, and polar associations are determining factors. The assumption that naphthenic (cyclic) hydrocarbons have better compatibility with GR-S-type polymers than have straight paraffinic hydrocarbons is based on this concept.

D. V. Sarbach and B. S. Garvey, Jr. *(81)* have shown the influence of structure on compatibility by comparing the swelling of unvulcanized rubbers in various types of solvents. Influence of structure on compatibility on the basis of swelling of vulcanized rubbers was shown by the author in a previous paper *(82)*.

In terms of the group analysis *(80)*, it can be stated that a low content of saturated hydrocarbons (paraffins) is desirable for maximum compatibility with most rubbers—natural rubber, styrene rubbers, neoprenes, and nitrile rubbers.

Permanency of the Extender:

The term permanency, as used by compounders, has two meanings—retention of the plasticizer itself in the vulcanized compound and retention of the plasticizing effect after vulcanization.

Permanency is usually judged by heat loss as far as retention of the plasticizer in the vulcanizate is concerned. Migration of the plasticizer or the tendency to bloom are, however, to be considered also. It should be visualized that of two products showing the same amount of heat loss the one with the lesser tendency to migrate will be more permanent. This type of permanency is, therefore, closely dependent on compatibility.

As far as retention of the plasticizing effect after vulcanization is concerned, the unsaturated components (1st and 2nd acidaffins), either by some type of covulcanization or by association of double bonds, are less permanent than paraffins. The softening effect of saturated hydrocarbons is less affected by vulcanization. Consequently, a low content of paraffins appears important in a plasticizer to be used as an extender in the co-coagulation with GR-S where high amounts of plasticizer are desirable for economic reasons.

Influence of the Extender on Processability:

The influence on processing is closely related to the above discussed properties—compatibility and permanency—and is largely inherent in the composition of the plasticizer. Paraffins function as internal lubricants and, due to their blooming tendency, interfere with

building tack. Second acidaffins, if they are the predominant component of a plasticizer, make the best processing oil; their affinity for rubber is less than that of the 1st acidaffins but much higher than that of the paraffins. Consequently, they have a certain lubricating effect, which makes for cooler tubing and lower tack, but their affinity for rubber is high enough that they do not bloom. For the manufacture of an oil-plasticized co-coagulate for special purposes, for instance when good color is important, a plasticizer consisting predominantly of 2nd acidaffins and free of the darker oil components such as nitrogen bases and 1st acidaffins might be preferable. However, if a co-coagulate extended by large amounts of plasticizer is desired, a combination of 1st and 2nd acidaffins appears necessary since the softening effect of the plasticizer is then less permanent after vulcanization.

Influence of the Extender on the Physical Properties of the Vulcanizate:

The influence of a petroleum plasticizer on the physical properties of the vulcanizate is decidedly governed by its percentage composition of the five basic groups of components: asphaltenes, nitrogen bases, 1st acidaffins, 2nd acidaffins, and paraffins, as well as by the viscosity of the plasticizer. It is most important that the specific effects of the components of a plasticizer-extender to be used for co-coagulation with an elastomer be considered in respect to the particular properties which are desired in the end product. The influence of the individual groups of components has been shown in some detail in a previous paper dealing with the group analysis *(80)*. The tables and figures given below illustrate somewhat further the specific effects which these groups have. The data support the following general conclusions:

Asphaltenes: Asphaltenes give high tensile and high hardness if used in considerable amounts and if the plasticizer containing the asphaltenes is substantially free of paraffins. Small amounts of asphaltenes in a plasticizer are of no avail; they just ruin the color and cause staining.

The beneficial effect of asphaltenes in the form of 40 parts of gilsonite on 100 GR-S was first shown by A. H. Selker, A. H. Scott, and A. T. McPherson *(83)*. Table X and Figure 3 compare four GR-S compounds containing 40 parts of plasticized asphaltenes* and increasing amounts of black with four controls without asphaltenes. The data suggest the conclusion that asphaltenes are most valuable in compounds of low black loading, such as for cable and wire insulation, no-mark soles and heels, etc. If co-coagulates for these special applications are to be made, asphaltenes would be indicated as the extender to be used.

Nitrogen Bases: Nitrogen bases are the components responsible for curing characteristics. The nitrogen bases in plasticizer-extenders function as mild secondary accelerators and have the advantage of more even

* The plasticized asphaltenes used in this study are commercially available as G. B. Asphaltenes, and have the advantage over gilsonite that they are dispersible in rubber under ordinary milling conditions. The composition of the G. B. Asphaltenes used in this study was as follows:

	%
Asphaltenes	48.0
Nitrogen bases	30.2
1st acidaffins	4.6
2nd acidaffins	13.4
Paraffins	3.8

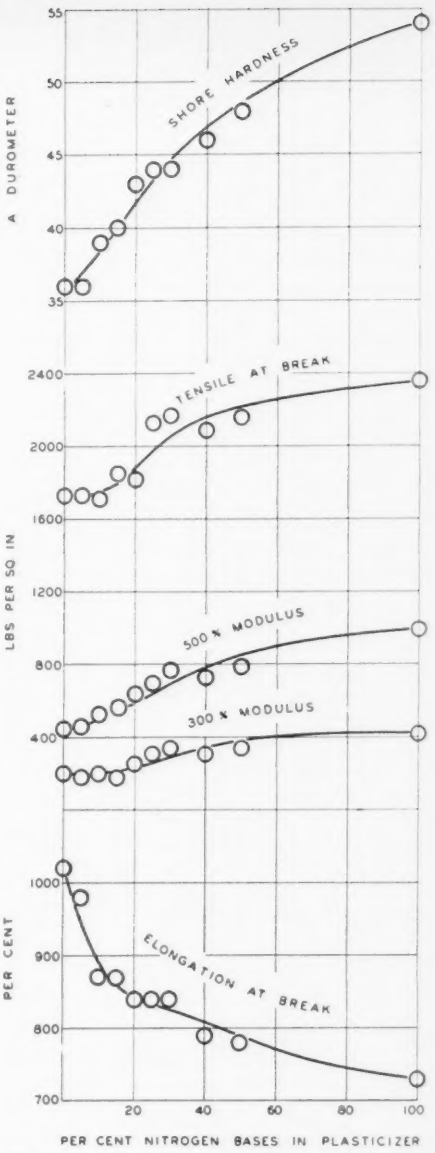

FIG. 4—Comparison of plasticizer with increasing amounts of nitrogen bases at one cure.

TABLE XI—TEST FORMULA USED FOR DATA IN FIGURE 4 AND TABLE XII

GR-S	100.
Sulfur	3.
Stearic acid	0.50
MPC black	55.
Zinc oxide	5.
Benzothiazyl disulfide	1.50
Diphenylguanidine	0.25
Plasticizer*	40.

* Experimental plasticizers 1 to 10 with increasing amount of nitrogen bases.

TABLE XII—EFFECT OF NITROGEN BASES AT OPTIMUM CURES

Plasticizer	No.4 (15% Nitrogen Bases)	Califlux G. P. (18% Nitrogen Bases)	No.5 (20% Nitrogen Bases)
Optimum cure at 45 lb.	80′	65′	60′
Shore A hardness	50	50	50
300% Modulus (psi)	530	580	530
500% Modulus (psi)	1360	1300	1300
Tensile at break (psi)	1980	2000	2020
Elongation at break (%)	590	650	630

TABLE XIII—INFLUENCE OF PARAFFINS ON PHYSICAL PROPERTIES

Compound No.	1	2	3
GR-S	100.0	100.0	100.0
Stearic acid	1.0	1.0	1.0
Sulfur	2.00	2.30	2.00
Zinc oxide	5.0	5.0	5.0
MPC black	30.0	30.0	30.0
Califlux G. P.	—	15.9	—
White oil	2.0	1.1	17.0
Benzothiazyl disulfide	1.50	1.50	1.50
Scott plasticity (compression in 0.001 in.)	160	260	235
Optimum cure at 45#	80′	80′	80′
Shore A hardness (30 sec.)	54	50	43
(Aged 24 hrs., 100° C.)	62	58	53
Modulus at 300% (psi)	810	520	360
Modulus at 500% (psi)	1940	1270	960
Tensile at break (psi)	2170	2080	1140
(Aged 24 hrs., 100° C.)	1790	1730	1160
Elongation at break (%)	550	630	570
(Aged 24 hrs., 100° C.)	340	440	370
Set at break (%)	13	14	14
Luepke resilience—			
1st impact	71	69	69
4th impact	26	24	24

distribution throughout the mix over organic secondary accelerators commonly used in amounts of fractions of 1%. Plasticizers containing a certain amount of nitrogen bases are considered superior to those without nitrogen bases. The concentration of nitrogen bases is of considerable importance, especially with respect to reproducibility of curing characteristics. This was shown in the following test.

Ten experimental plasticizers having varying amounts of nitrogen bases were produced by splitting a petroleum plasticizer into nitrogen bases and a fraction free of nitrogen bases and by then blending the two fractions in varying proportions so that the resulting ten experimental plasticizers differed only in their content of nitrogen bases. The ten experimental plasticizers were compounded in the test formula shown in Table XI. The physical properties of the mixes, when cured for 20 min. at 45 lbs., were as shown in Figure 4. The data suggest that smaller amounts than 15 per cent are ineffectual and that higher amounts than 30 per cent might make some stocks scorchy. A 15 to 30 per cent concentration of nitrogen bases, therefore, appears practical in a general purpose plasticizer.

Table XII shows physical test data of compounds containing experimental plasticizers Nos. 4 and 5 and Califlux G. P., which has a nitrogen bases content between Nos. 4 and 5. More data on the influence of nitrogen bases on rate of cure have been reported previously *(80)*.

The nitrogen bases also have considerable influence on increasing the tack of uncured stock, probably due to their solvency and polarity.

First Acidaffins: This component creates the demand of the plasticizer-extender for sulfur. It is also the component mostly responsible for building tack and the compatibility of a plasticizer with elastomers. Stress-strain properties of vulcanizates are also high if the plasticizer-extender contains high amounts of this group of hydrocarbons. They are believed essential in any plasticizer-extender to be recommended for the co-coagulation process if a saving of elastomer is to be attained. Compounding data have been reported earlier *(80)*.

TABLE XIV—COMPOSITIONS AND VISCOSITY OF PLASTICIZERS USED IN TESTS SHOWN IN FIG. 5 AND TABLES XV AND XVI

Product	Viscosity at 90° C.	% Asphaltenes	% Nitrogen Bases	% Acidaffins	% Paraffins
Califlux 510	9 cP	0	12.4	76.9	10.7
Califlux G. P.	36 cP	0	18.7	70.5	10.8
Califlux 550	190 cP	0	27.1	66.0	6.9

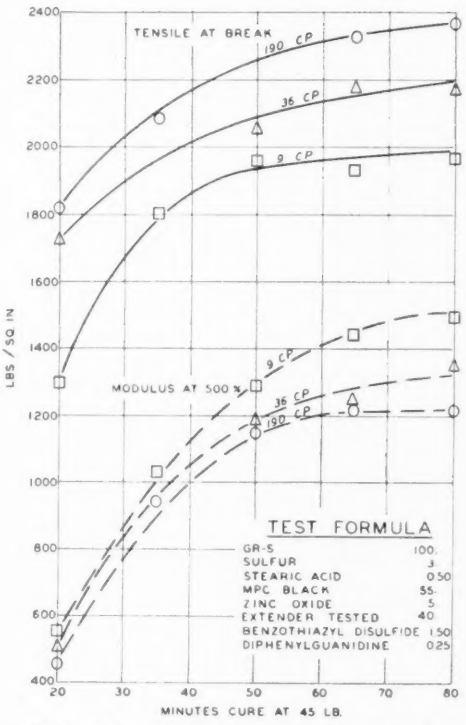

FIG. 5—Effect of viscosity of plasticizer-extenders on modulus.

TABLE XV—INFLUENCE OF VISCOSITY OF PLASTICIZER ON MODULUS OF CARBON BLACK COMPOUNDS

Compound No.	1	2	3	4	5	6	7	8
GR-S	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Stearic acid	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Sulfur	3.00	3.00	3.00	3.30	3.30	3.00	3.00	3.00
Zinc oxide	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
MPC black	55.0	55.0	55.0	85.0	85.0	—	—	—
SRF black	—	—	—	—	—	80.0	80.0	80.0
Califlux 510	40.0	—	—	50.0	—	40.0	—	—
Califlux G. P.	—	40.0	—	—	—	—	40.0	—
Califlux 550	—	—	40.0	—	50.0	—	—	40.0
Benzothiazyl disulfide	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Diphenylguanidine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Scott plasticity (compression in 0.001 in)	260	265	215	175	160	340	355	355
Optimum cure at 45#	65′	80′	80′	65′	65′	65′	65′	65′
Shore A hardness (30 sec.)	49	50	51	61	63	51	50	51
Modulus at 300% (psi)	570	530	520	1010	880	1060	840	800
Modulus at 500% (psi)	1430	1350	1220	2030	1850	—	1400	1350
Tensile at break (psi)	1930	2170	2370	2140	2420	1560	1490	1760
Elongation at break (%)	570	650	720	520	590	470	530	620
Set at break (%)	20	21	30	37	41	17	19	32

Second Acidaffins: These have lower sulfur demand than the 1st acidaffins. They are lighter in color. They are less tack-producing than either the nitrogen bases or 1st acidaffins. Their compatibility with elastomers (GR-S and others) is good. They are non-blooming even if used in high amounts with oil-resistant rubbers (50 parts on 100 parts of neoprene can be mixed without causing bloom of the vulcanizates even if no filler is used in the compound). Second acidaffins are considered the most valuable component of process oils. Their presence in plasticizers for the co-coagulation process is considered beneficial.

Paraffins: This component is detrimental to tensile strength and building tack. Its principal function is as a lubricant and anti-sun-checking agent. The use of plasticizers consisting predominantly of paraffins is not to be recommended. The compounds in Table XIII demonstrate the detrimental effect of paraffins on physical properties.

Viscosity: Viscosity is one of the physical characteristics of an extender which has an influence on physical properties of the vulcanizate. Of two plasticizers of equal composition but differing in viscosity (molecular weight), the one with the lower viscosity will give the higher modulus. Higher-viscosity products, on the other hand, give higher tensile strength and higher elongation. The modulus-viscosity interdependence is easily understood by considering that it is a geometric necessity when plotting tensile against elongation that of two compounds of approximately the same tensile at break but of different elongation, the one with the higher ultimate elongation must also have lower modulus. The effect of viscosity is often masked by the effect of differences in proportions of components. It is, however, a basic fact to be considered.

The influence of viscosity is shown in Figure 5. The composition of the plasticizers compared is given in Table XIV. The three plasticizers used are of very similar composition, but the viscosity ranges from 9 cp to 190 cp at 90°C. Califlux 550, which has the highest viscosity, shows lower modulus than the other two plasticizers used. That this is a general rule can be seen by comparing the modulus figures in Tables XV and XVI.

In Table XV the first three compounds show the three plasticizers differing primarily in viscosity in a test formula containing 55 parts of MPC black. The next two compounds have higher black loadings. The decrease in modulus with increasing viscosity of the plasticizer is noticeable for both black loadings. The last three compounds in this series, containing 80 parts of SRF black, show that the influence of viscosity of a plasticizer is independent of the type of black used.

In Table XVI is shown that the influence of viscosity of the plasticizer is also clearly visible in compounds containing an additional amount of an incompatible plasticizer.

TABLE XVI—INFLUENCE OF VISCOSITY OF PLASTICIZER ON MODULUS OF COMPOUNDS CONTAINING SOLID PARAFFIN AS SECONDARY PLASTICIZER

Compound No.	1	2	3
GR-S	100.0	100.0	100.0
Sulfur	1.00	1.00	1.00
Califlux 510	40.0	—	—
Califlux G. P.	—	40.0	—
Califlux 550	—	—	40.0
EPC black	45.0	45.0	45.0
Stearic acid	0.50	0.50	0.50
Zinc oxide	5.0	5.0	5.0
Heliozone	2.0	2.0	2.0
Paraffin wax	6.0	6.0	6.0
Santocure	1.50	1.50	1.50
Tuads	0.50	0.50	0.50
Scott plasticity (Compression in 0.001 in.)	335	310	300
Optimum cure at 60#	30′	30′	30′
Shore A hardness (30 sec.)	27	27	26
(Aged 24 hrs., 100° C.)	39	37	37
Modulus at 300% (psi)	90	90	70
Modulus at 500% (psi)	330	280	220
Tensile at break (psi)	1460	1550	1630
(Aged 24 hrs., 100° C.)	1560	1520	1540
Elongation at break (%)	980	1010	1090
(Aged 24 hrs., 100° C.)	800	900	960
Set at break (%)	21	23	27
Luepke resilience—			
1st impact	58	57	55
4th impact	12	11	9
Tear resistance (lb./in.)			
Lengthwise	160	120	210
Crosswise	120	140	200

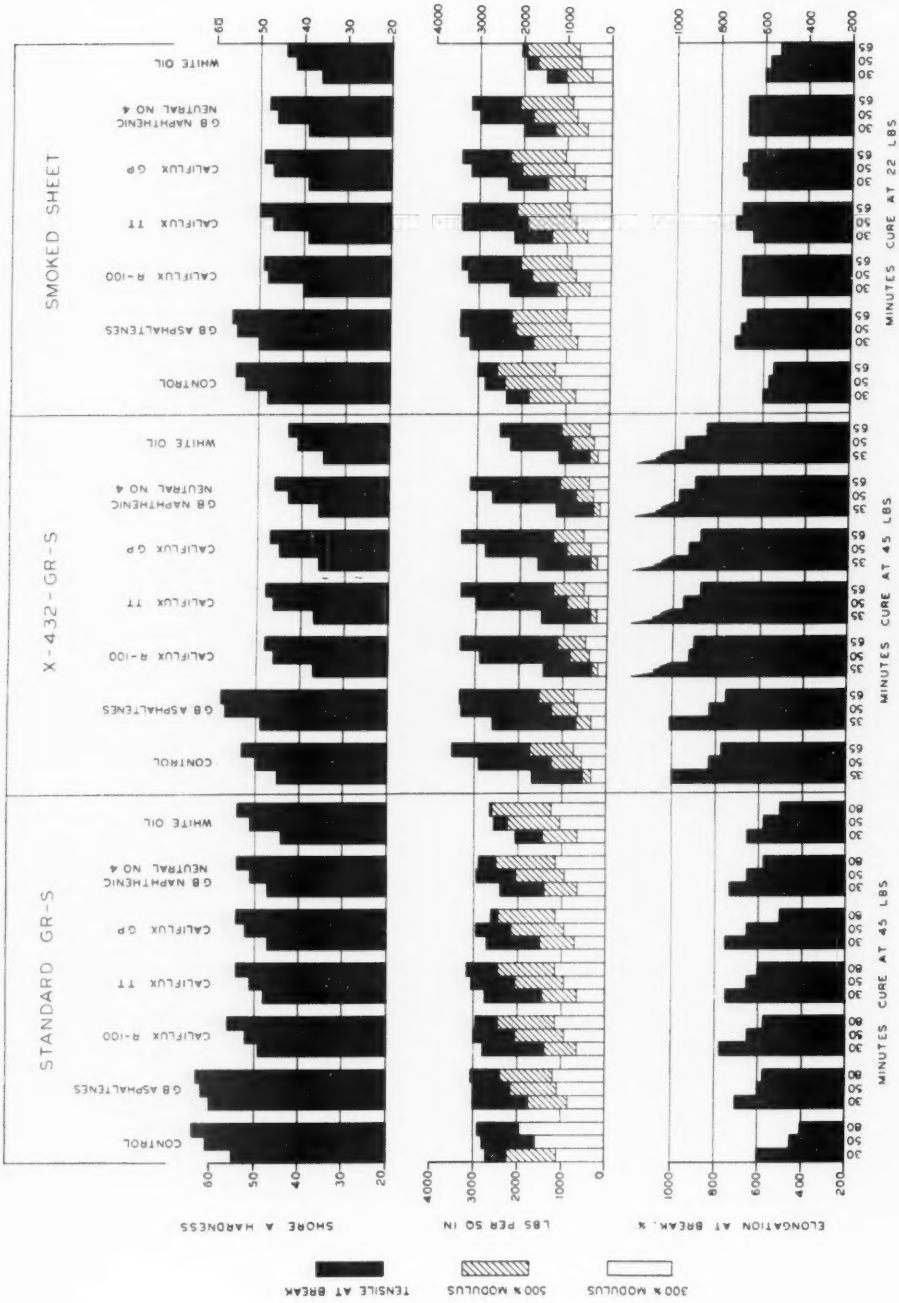

FIG. 6—Comparison of influence of plasticizer composition on physical properties.

TABLE XVII—TEST FORMULAS USED FOR DATA IN FIGURE 6

Test Formula	B1	B2	B3	B4	B5	B6
Standard GR-S .....100.	100.	——	——	——	——	——
X-432-GR-S	——	——	100.	100.	——	——
Smoked sheets	——	——	——	——	100.	100.
Sulfur	2.	2.	3.	3.	2.	2.
Stearic acid	1.	1.	1.	1.	1.	1.
Zinc oxide	5.	5.	5.	5.	5.	5.
EPC black	50.	50.	50.	50.	50.	50.
Benzothiazyl disulfide..	1.50	1.50	1.	1.	1.50	1.50
Diphenylguanidine	0.25	0.25	——	——	0.25	0.25
Plasticizer as shown in Figure 6	12.	——	12.	——	12.	——

TABLE XVIII—COMPOSITION OF PLASTICIZERS USED IN TESTS SHOWN IN FIGURE 6

	% Asphaltenes	% Nitrogen Bases	% 1st Acidaffins	% 2nd Acidaffins	% Paraffins
G. B. Asphaltenes	47.9	30.3	4.6	13.2	4.0
Califlux R-100..	0.0	24.5	21.8	45.7	8.0
Califlux TT....	0.0	23.1	21.0	47.2	8.7
Califlux G. P...	0.0	18.7	15.5	55.0	10.8
G. B. Naphthenic Neutral No. 4	0.0	13.8	14.8	34.8	36.6
White oil	0.0	0.0	0.0	0.0	100.0

For the co-coagulation process this suggests that, other factors being equal, a medium to high viscosity plasticizer is preferable to one of low viscosity.

Specification Products: It can be stated on the basis of the above discussions that it is important to choose the correct composition and to specify it if reproducibility of results is to be safeguarded.

The influence of the various groups of components is dependent on their amounts in the plasticizer, the amount of plasticizer used, and the type of elastomer. That relatively small amounts show distinct differences is shown in Figure 6, in which is compared the influence of six different plasticizers on Standard GR-S, a low-temperature polymer, and natural rubber. The test formulas and the compositions of the plasticizers are given in Tables XVII and XVIII. The compounding data were supplied by R. Kettering of Oliver Tire & Rubber Co., and are reproduced here with his permission *(84)*. It can be seen from the data presented that the influence of the different plasticizers is in accordance with their composition. These influences are, of course, magnified when large amounts of plasticizer are used.

The principal conclusion to be reached from the data is that the composition of a plasticizer is clearly reflected in its performance and that plasticizers of very similar appearance will give reproducible results in physical properties only if their chemical composition is kept constant. On the basis of the above tests the writing of specifications for the plasticizer to be used in the co-coagulation process appears essential.

In order to show how some of the commercially-available plasticizers compare in composition, analytical data obtained in our laboratory* on some representative, commercially-available products are shown in Table XIX. It can be seen from these data that the quantitative group analysis, complemented by the viscosity figure, reveals which products are equivalent and that prediction of performance can be made on the basis of the analytical data without the necessity of resorting to compounding tests for each product, while trade names and physical characteristics by themselves do not allow such conclusions.

Plasticizer-extenders of a great variety of composition are commercially available, and almost any blend of components can be and will be produced to specifications if the rubber industry demands it.

Influence of Emulsification of Plasticizers on Properties of the Co-Coagulate:

The influence of dispersion of the plasticizer in the emulsion used in the co-coagulation process might have a considerable influence on the properties of the co-coagulate. A number of investigations have dealt with the influence of fineness of the dispersion of blacks in water before co-coagulation *(50, 51, 52)*, but no report of an investigation has been published on dispersion of plasticizer for use in the co-coagulation process.

* It must be mentioned that the data reported might be reproducible only in the case of Golden Bear products, for which this method of analysis is used for quality control. In previous reports *(26, 80)* it was shown that several different samples of a proprietary product may have a wide variety of compositions.

TABLE XIX—TYPICAL ANALYSIS OF SOME COMMERCIALLY AVAILABLE PETROLEUM PRODUCTS

Designation	Sp. Gr. 60/60	Viscosity at 25° C. cP	Composition by Group Analysis: Nitrogen Bases	1st Acidaffins	2nd Acidaffins	Paraffins
Sundex 53	0.968	285	3.2	8.4	64.3	24.1
Califlux 510	1.000	450	12.4	13.9	63.0	10.7
Califlux G. P.	1.017	12,000	18.7	15.5	55.0	10.8
Dutrex 6	1.011	27,000	15.0	19.0	54.8	11.2
Califlux TT	1.022	85,000	23.1	21.0	47.2	8.7
Golden Bear Light Process Oil	0.960	55	0.0	16.5	59.2	24.3
Circo Light Process Oil	0.922	62	0.0	5.2	35.6	59.2
Golden Bear Naphthenic Neutral No. 2	0.927	70	4.1	11.1	34.3	50.5
Golden Bear Naphthenic Neutral No. 4	0.967	7000	14.6	14.3	35.4	35.7
Golden Bear 132 Stock (medium grade California lubricating oil stock)	0.959	1820	9.6	13.6	38.4	38.4
Circosol 2XH	0.935	1750	2.0	6.0	39.7	52.3
Protexol SAE 50 (solvent refined California lubricating oil)	0.910	940	0.0	6.2	31.8	62.0

F. F. Lucas *(85)* has published an extremely interesting paper showing the arrangement of the particles in latex and the tendency to arrange in doublets composed of a large particle and an associated small particle acting as a satellite. Particles of varying size seem to have a tendency to form a group or constellation. The motions of a constellation appear to be centered about the largest particle, which particle may have several satellites, it is reported. The same author reported in an older paper *(86)* on ultraviolet microscopy of hevea latex that Brownian motion had been arrested by diluting the latex with salt solution; the particles gradually slowed down and the motion stopped. Positions indicated some sort of relation between particles. Doublets were very common in this arrested position.

The phenomena reported might have considerable bearing on the co-coagulation process, and deserve further study in connection with co-coagulation. Since emulsions of a great variety of plasticizers and variety of particle sizes can easily be produced, the possibility exists that emulsions may be produced which will give a wide variety of constellations of plasticizer and elastomer particles. It appears highly advisable to study the particle arrangement obtainable with plasticizer emulsions of various fineness and polymer latices.

Microscopic studies of mixed emulsions should provide, among other important information, the answer to the question of desirable speed of co-coagulation and of concentration and constellation of the solids in the latex. Slowing down the Brownian movement by the gradual addition of coagulants until a preferred constellation of particles has been obtained and then co-coagulating by "shock coagulation" should be worth looking into. Ternary systems of polymer, plasticizer, and black should also be studied. Another possibility of producing high-grade co-coagulates worth investigating might be to make a black dispersion in a plasticizer first and then to emulsify the dispersion and co-coagulate it with latex.

Availability and Economic and Political Aspects:

The seriousness of the rubber situation during the last war has changed from being acute to being chronic, a fact which seems to be generally recognized. But what seems not to be considered is that the oil situation is also critical and that there is the impending danger that we will not be able to use any petroleum product at will. With this in mind it is the duty of everyone concerned with securing raw materials to make sure that we decide carefully which portion of petroleum should be preferentially considered for the co-coagulation process. It is very fortunate that we have in the by-products from the refining of lubricating oils a raw material which is plentiful and most suitable for the production of extenders for rubber.

There are a number of economic aspects to be considered. The principal one is that the unsaturated components, as discussed above, have hardly any other large-scale use which would compete with the use of these products by the rubber industry. This is important not only as far as the price structure is concerned, but also with respect to national economy and conservation of natural resources.

To use petroleum oils, which are basically the stock for lubricating oils, as raw materials for the manufacture of plasticizers appears unwise, not only because they are less suitable in quality, but also because a shortage of those oils might develop at any time.

Summary

A quantitative analysis based on precipitation with specific reagents is available for specification purposes, defining petroleum products as consisting of groups of components which can be identified as asphaltenes, nitrogen bases, 1st acidaffins, 2nd acidaffins, and paraffins. A blend of petroleum components consisting predominantly of nitrogen bases and acidaffins is the most suitable plasticizer for the oil-rubber co-coagulation process. The acidaffins are highly compatible, and they impart good building tack and processability with little sacrifice in quality of the ultimate vulcanizate. The nitrogen bases, if present in amounts of 15 to 30 per cent, assure a flat-curing, non-scorchy polymer. Small amounts of asphaltenes and high amounts of paraffins are undesirable—the asphaltenes because they don't appreciably plasticize and because they make the finished product dark, and the paraffins since they are less compatible than the acidaffins and have a lubricating effect, which interferes with banding and knitting properties of the co-coagulate.

For some purposes it might be advantageous to use a plasticizer consisting predominantly of the unsaturated hydrocarbons, Group II, defined as 2nd acidaffins. This group is non-staining, non-blooming, and practically without influence on cure. The physical properties are, however, somewhat lower than those of a co-coagulate with a plasticizer containing in appreciable amounts nitrogen bases and the more reactive hydrocarbons, named 1st acidaffins. The by-products of the refining of lubricating oils are suitable raw materials for the unsaturated hydrocarbon extenders in question, are available in large amounts, and should be considered as a primary source of extenders.

Conclusions

It has been shown that the process of co-coagulating synthetic elastomers with petroleum-produced extenders and processing aids is not to be considered a new theoretical approach or revolutionary compounding technique; every step of the process has been suggested previously and, in one way or another, has been used. This fact is to be considered an asset rather than a drawback of the process since it can thus be considered to be of sound theoretical background as well as proven in practice. Although various improvements in the process are to be expected in the future, sufficient information is now available to produce on a large scale synthetic elastomers with processing characteristics similar to those of natural rubber.

Analytical methods are available for defining the petroleum products to be incorporated in the process. For chemical, economic, and security reasons, as well as for the purpose of conserving national resources, the resinous portion of petroleum originating from the by-products of oil refining is to be preferred to petroleum fractions which are usable raw materials for the manufacture of lubricating oils.

Establishing specifications for plasticizers on the basis of a quantitative analysis would provide exact quality control and the possibility of finding more than one source of supply for the petroleum products to be used. It is believed that both manufacturers and suppliers would benefit by buying and selling on the basis of composition rather than on the basis of claims which are open to question. Cooperation among manufacturers of elastomers and among suppliers of petroleum products used in the manufacture of synthetic elastomers, as well as between the manufacturer and supplier, should be sought in the interests of progress as well as of national security.

ACKNOWLEDGMENT

This article, being a review article complemented by new data, is the result of extensive investigations carried out over a period of years and with the assistance of many who took an interest in the work. This cooperation is most gratefully acknowledged, especially the assistance received from persons outside our own organization. Some of them have been mentioned in this report. Of close co-workers, special mention is due to R. M. White (Golden Bear Oil Co.), who did most of the analytical work and gathering of data on the petroleum products; to V. M. Wilson, who did the preliminary work on emulsions; to H. I. du Pont, R. Weil, and K. S. Rostler (formerly of Wilmington Chemical Corporation), who supervised the rubber testing; and to E. V. Osberg (now with General Tire & Rubber Co.), who assisted substantially in keeping the records of the work and who cooperated in writing the reports to the Rubber Director's Office on the co-coagulation tests.

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A new **hydraulic remote control system** is now being offered by Superdraulic Corp., Detroit, Mich. The complete remote control system consists of a master unit and a slave unit interconnected by two small tubes. Motion applied to the actuating lever of the master unit is accurately duplicated by the slave unit lever. It has positive load carrying ability in both directions.

Featuring a stainless steel case, a new thermometer, **TAG Model 8689,** is now available through the manufacturer, Tagliabue Instruments Division, Weston Electrical Instrument Corp., Newark, N. J. The all-purpose instrument is suited for use wherever an accurate, dependable thermometer is needed regardless of weather or other conditions.

A new midget unit for **liquid blast cleaning** has has been announced by the Pangborn Corp., Hagerstown, Md. Only 40 pounds in weight (where aluminum can be used for the main housing), the unit is operable from either a ¼ inch compressed air line or any bottle or compressed gas. The unit incorporates a blast chamber 15 inches in diameter.

Taber Instrument Corp., North Tonawanda, N. Y., has made available the **Model 138 Sheet Plastic Cylinder Fabricator** for making rigid transparent cylinders for transparent packages and visual displays. The cylinder is automatically sized to exact diameter before the lap joint is sealed thus eliminating variation in diameter due to looseness of wrap of the sheet around a solid mandrel.

Application of Fungicides to Rubberlike Polymers and Related Materials

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IT IS generally conceded that with synthetic rubbers and compounded rubber, the occurrence of fungal growths is confined to the surface and usually is unaccompanied by any harmful effects, except in the case of electrical components. All information today indicates that vulcanized natural rubber, GR-S, neoprene, rubbers of the butadiene-acrylonitrile copolymer class, such as Hycar and Paracril, Butyl and the Thiokols, are relatively free from fungal attack. What growth does occur is superficial and is related to surface contamination or the presence of occluded vulnerable material. There is no need for the deliberate inclusion of fungicidal agents in rubber, insofar as the normal mechanical considerations of service are concerned.

In a similar manner, synthetic resins such as polyethylene polymethylmethacrylate, polystyrene, polyvinyl acetate, polyvinyl chloride, phenol-formaldehyde, melamine-formaldehyde, and urea-formaldehyde, are resistant to attack by fungi. The resins on which a wide array of items are based may be similar and resistant to fungal attack.

The complete compositions of the final articles are often different. Frequently, plies of fabric are used, or paper if it has been prepared from laminated stock, or it may have a filler added, if it is a molded piece. In a like manner, films and coated fabrics employing vinyl esters have added plasticizers, lubricants and stabilizers. If it is kept in mind that commercial plastics are complex mixtures, the conflicting reports concerning micro-biological deterioration are understandable.

Recognition of Components Involved

Realizing that a mixture of components is involved, the first step in overcoming fungal attack and damage to plastics, is to check all the components for fungal susceptibility and then utilize resistant components or introduce fungicidal agents wth the susceptible materials. Fabric laminates, in which linen and cotton duck are employed, may be susceptible to fungal attack and damage when egress of the fungi to the cellulose is effected. Paper-based resin-impregnated materials are classed more resistant than fabric with glass laminants being completely resistant.

In the case of molded thermosetting materials, phenolics filled with wood flour and rag are considered capable of supporting fungal growth, under tropical conditions and when the resin glaze is broken by abrasion, whereas those filled with glass and related inert material are resistant. In the case of films and coated fabrics, the plasticizer governs the susceptibility of the film to microbiological deterioration. As expected, plasticizers vary in their resistance. If resistant plasticizers and minor quantities of susceptible lubricants are used the thermosetting plastic compositions are quite resistant. For instance, polystyrene, polyethylene, and nylon, in which little or no plasticizers are employed, are resistant to fungi, while cellulose acetate, ethyl cellulose, and polyvinyl compounds, in which large quantities of vulnerable plasticizers are employed, present a problem directly related to their susceptible plasticizer content.

The only criterion of susceptibility for films and coated fabrics is whether the material serves as nutrient for fungi. That is, whether fungal enzymes degrade the susceptible plasticizer or attack the base fabric. Assuming certain required characteristics are only obtained by using susceptible materials, the problem can be solved by utilizing a suitable fungicide at an effective concentration.

Requirements for an Effective Fungicide

In order for a fungicide to be effective in plastics, it should conform to the following requirements: (1) It should be compatible with the resin; (2) It should have low volatility and heat stability so that it would not be lost during the molding or curing operation; (3) It should be resistant to leaching by water; (4) The fungicide should have no effect on the physical characteristics of the finished composition; (5) The fungicide should be biologically effective, but chemically inert; (6) It should be durable for the service life of the item; (7) It should be non-injurious to workers handling the material during manufacturing, or to the using personnel.

Studies to date in various laboratories reveal that plasticizers of the oil base type such as the ricinoleic acid derivatives (methyl acetyl ricinoleate), sebacic acid derivatives (dibutyl sebacate), and others of related derivation are generally susceptible to fungal degradation while the phthalic acid and phosphoric acid derivatives in general do not support growth of fungi. The latter types do not exhibit any inhibitory properties when mixed with varying percentages of vulnerable materials. When special characteristics or shortages require use of oil base plasticizers in plastic films, it may be necessary to protect the vulnerable plasticizer with a suitable fungicide.

An obvious and elementary question arises: Is it necessary to obtain absolute protection against fungi? This can only be answered by common sense and judgment as to what end the film or coated fabric will be placed and whether the item will be subjected to an environment conducive to attack. In the case of many civilian items, one only need review past experience. In the case of military materials, the particular service using the item will, in most cases, provide for the required mildew resistant qualities of the finished item in the specification.

For example, materials whose past use indicate serious losses or impairment of performance due to fungal

Note: This article is based on a talk given by the author before the Connecticut Rubber Group, New Haven, Conn., May 11, 1951.

growth or damage may require the use of non-vulnerable plasticizers or the presence of a specified amount of a known effective fungicide in the coating or film. It has been found that fungal attack, sometimes without the presence of profuse fungal growth, causes stiffening of the film or coated fabric due to loss of the oil base plasticizer through degradation. Previously, this stiffening was believed to be due to plasticizer migration or to some unknown chemical effect caused by formulating.

Methods of Evaluation

In an attempt to evaluate plasticizers and fungicides, several ingenious methods have been tried. These include a monometric method which involves measurement of oxygen absorption and carbon dioxide production in a modified Warburg apparatus and a shake flask method. Both methods were developed in the Quartermaster Laboratories and offer considerable promise as rapid and easy methods for screening. The monometric method, developed by Mandels and Siu, is still being critically evaluated to determine its usefulness and its limitations; the shake flask method, developed by Beck and Harvey, is being routinely utilized for screening plasticizers and fungicides with considerable success.

Data (unpublished) indicate that the microscopic nature of the submerged growth of the mixed spores in 5% plasticizer concentration facilitated visual ratings of the amount of growth which compared favorably to quantitative determinations. The method is considered sufficiently precise for screening purposes. When applied, the method demonstrates a high degree of reproducibility. The simplicity and decreased time requirement offers many possibilities for its use in fungicide testing.

In the fungicide screening, it becomes necessary in the end to prepare experimental films since results obtained in our laboratory indicate that inhibition shown by a fungicide in the plasticizer alone does not necessarily mean the fungicide will be effective when incorporated in the film. For instance, out of some 40 fungicides examined 14 were effective in preventing growth in the plasticizer alone, but when incorporated in the film at several levels only one of the 14 showed protection as determined by lack of stiffening.

The reader will excuse this digression. It is inserted only to point out that logic and discretion must be used in settling on a suitable plasticizer and fungicide. The degree and kind of protection desired must be determined in each case on the ultimate use of the item. Is it loss in tensile strength, stiffening, or visual growth, or a combination? In keeping with the over-all problem, testing procedures have been developed by Meloro and Beck of the QM Laboratories for plastic films and coated fabrics; the procedures take into account type of material, i.e., lightweight films and coated fabrics such as raincoats and shower curtains, heavily coated base fabrics intended for upholstery use, and heavy base fabrics with coatings which in use may be in contact with the ground, for example, tentage and tarpaulins.

The evaluation criteria include visual growth, tensile strength and stiffness; the tests include inoculation and incubation on agar and soil burial. Copies of the method may be obtained on request from the author.

Selection of Proper Fungicide

Assuming the use of a non-vulnerable coating, such as rubber on a coated fabric, or the use of protected oil base plasticizers or non-vulnerable plasticizers, the question of protecting the base fabric becomes obvious. This can be answered by using a fungal inert fabric such as nylon, or if cotton or rayon is used, by treating it with a suitable fungicide at the correct concentration. Here there is a wide choice of agents, depending on the type of item, its intended end use, and treatment during fabrication.

In general, it is advisable to use a compound relatively insoluble in the plasticizer in the coating. There should be a water repellent employed over the fungicide if the latter is soluble in water or if no backing coat is employed over the base fabric. The choice of fungicide must also be governed by its stability in the presence of temperatures encountered during curing as well as other important factors, such as its fungicidal effectiveness, its compatibility with the coating, and absence of any adverse effect on the adhesive properties of the coating.

To name suitable fungicides here would be "Carrying Coals to New Castle," since a number of reputable concerns produce fungicides tried in their own laboratories and in commercial use. The fungicides are well known to industry and the decision to use them rests on the need and desire to produce a quality material capable of meeting the stresses placed on it during its normal civilian use.

In the case of military items, fungicidal compounds required are spelled out in the specification for the item. The selection is made on a conservative basis with full consideration being given to its performance under the extremes the item is subjected to during use, ease of application, compatibility, availability, and freedom from toxic hazards to personnel engaged in fabrication or using the end item, consideration from the latter viewpoint being based on the recommendation of the Surgeon General of the Department, who is responsible for advising the technical service as to the possible deleterious effects on military personnel of the item in question.

In the case of the Surgeon General of the Army, there is no blanket approval of a fungicide; each recommendation concerning use of a fungicide applies to the treated finished item of equipment and not to the fungicide used on it.

In conclusion, it is believed that while our ignorance is unfortunately profound with respect to fungal resistance problems as they relate to films, coated fabrics and textiles, we have available a mechanism through industrial associations and fine industrial cooperation with the technical services in the defense establishment whereby information on the suitability of products is established and is pieced together so that we may collectively do a better job in keeping our country and our industry strong and successful.

Newly designed **hand pumps** in five series of 7, 10, 14 and 28 gallons, each in several models, have been introduced by the Blackmer Pump Co., Grand Rapids, Mich.

Lamson Corp., Syracuse, N. Y., has announced a new **Automatic Pallet Loader** for 36-inch wide pallets. The new modification brings the advantages of mechanized pallet loading to those industries whose products are best palletized on the 36-inch pallets rather than on the previous minimum width 40-inch pallet.

The **Camachine Triplex,** designed by the Cameron Machine Co., Brooklyn, N. Y., a new slitting and rewinding machine used for converting acetate film, has a rewind capacity of 15 inches diameter. The machine is equipped with a variable speed hydraulic drive and is designed for speeds up to 800 fpm.

Papers on Elastomers Will Be Presented at the 12th International Chemistry Congress

THE Executive Committee of Section 4 on Elastomers and Plastomers of the 12th International Congress of Pure and Applied Chemistry, which will be held on September 10 at the Hotel McAlpin in New York City, has announced completion of its program. The meeting of the section will feature the presentation of ten technical papers, covering the range of elastomer technology. Two sessions will be held, one in the morning and the other in the afternoon. Dr. R. P. Dinsmore (Goodyear) will preside at the morning session and Dr. W. A. Gibbons (U. S. Rubber) at the afternoon session. Dr. K. H. Meyer and Dr. G. F. Bloomfield will act as honorary chairmen, respectively, at the sessions.

The Section on Elastomers and Plastomers is one of several which will be held during the Congress which, in turn, is part and parcel of the two-week world chemical conclave to be held in conjunction with the Diamond Jubilee of the American Chemical Society. The ACS Jubilee Meeting will be held in New York from September 3 to 7. The 12th International Congress of Pure and Applied Chemistry will be held in New York from September 10 to 13. The 16th Conference of the International Union of Pure and Applied Chemistry will be held in New York on September 8 and 9 and again in Washington, D. C., on September 14 and 15.

The Executive Committee of Section 4 on Elastomers and Plastomers of the 12th International Congress of Pure and Applied Chemistry includes Dr. Dinsmore as chairman, N. E. Van Stone (Sherwin-Williams) as vice-chairman, and P. O. Powers (Pennsylvania Industrial Chemicals) as secretary. Members at large of the committee include J. D. Dillon (Textile Research Institute), George W. Morey (Carnegie Institution), Carlton H. Rose (National Lead), and Dr. Gibbons. Dr. Harry L. Fisher, of the National Research Council, Washington 25, D. C., is acting as administrative assistant for the Congress.

Abstracts of the ten scheduled papers to be presented at the Section 4 meeting, together with their authors and company connections, follow herewith:

ABSTRACTS OF PAPERS

Monday Morning—September 10

K. H. Meyer, Honorary Chairman

R. P. Dinsmore, Presiding

10:00 A.M.—1—Abrasion Resistance of GR-S Vulcanizates. *J. W. Adams, J. A. Reynolds, W. E. Messer, and L. H. Howland (U. S. Rubber Co., Naugatuck, Conn.).*

A method for determining the abrasion resistance properties of reinforced vulcanizates was required for evaluating new GR-S type elastomers and carbon blacks developed for use in automobile tire treads. In spite of the fact that past experiences revealed most laboratory machines to be unsatisfactory for testing GR-S vulcanizates, a program for evaluating several machines was undertaken. A Lambourn abrader (Dunlop Rubber Company, England) appeared to be most promising, for which reason efforts were expended on constructing a similar machine from parts available in the United States. The abrader that was built and operated to simulate wear brought about by a tire slipping on road surfaces embodied several modifications of the English model.

Data obtained from testing vulcanizates on the modified Lambourn abrader established that it was better than most laboratory devices for determining the effect of carbon blacks, elastomers, and other compounding variables on abrasion resistance properties as compared to tire tread wear resistance. More specifically, in the field of evaluating GR-S stocks, a partial solution of the often-termed "hopeless problem" of rating different vulcanizates with regard to wear was evidenced in the results.

10:30 A.M.—2—The Rubber Hydrocarbon in Freshly Tapped Hevea Latex. *G. F. Bloomfield (British Rubber Producers' Research Association, London, England).*

Solutions of the rubber hydrocarbon in the latex of *Hevea brasiliensis* can be conveniently obtained by allowing latex to flow from the tree directly into benzene or into a vistex solvent mixture. The hydrocarbon in such solutions is shown by osmotic and viscometric measurements to be of high average molecular weight but with a broad distribution from several million to below 100,000 with the major portion in the higher molecular weight range. Small proportions of soft plastic fractions of low molecular weight (below 100,000) isolated in fractional precipitation or diffusion processes contain small amounts of combined oxygen (less than 1%), even when latex is extracted from the tree under conditions precluding access of air.

Considerable differences in average molecular weight are found between trees and although significant differences are also observed between days within given trees throughout the course of observations extending for over a year, there are no indications of significant trends in molecular weight during periods of biological activity such as refoliation.

Although in a number of cases intrinsic viscosity can be correlated with plasticity of different rubbers, there are such wide deviations from this correlation that intrinsic viscosity cannot be used as a reliable indication of plasticity. Methods of determining plasticity appear to be more sensitive to the effect of structure (in the sense of regions of cross-linking) than is intrinsic viscosity. True microgel structure in which cross-linking is confined to the individual latex particles renders rubber very hard but may have little effect on the intrinsic viscosity, and although the hydrocarbon in fresh latex passes into solution readily on shaking, static diffusion into petroleum ether reveals the presence of microgel, the proportion of which is greater in hard rubbers than in soft ones.

The discovery that the latex in some untapped or long rested trees, and in the branches of some trees in regular tapping, contains a high proportion of microgel enables the area of bark affected by tapping to be defined since when an untapped tree is brought into production, the microgel latex distributed over a considerable area of the tree is replaced by normal latex. There is a tendency for the tapping of high yielding trees to affect the latex over a greater area of the tree than in low yielders.

When a tree containing microgel latex is brought into tapping the intrinsic viscosity of solutions of its latex increases progressively although the rubber becomes softer. If two tapping cuts are opened on the same tree, the latex drawn from the upper cut gives much harder rubber than that from the lower cut although the intrinsic viscosities of the rubbers from the two cuts are similar. Differences in non-rubber constituents are also found in the latices from the two cuts, the lower-cut latex containing more phosphorus and potassium but less magnesium than the upper cut latex.

11:00 A.M.—3—Breakdown of Synthetic Elastomers in a Banbury Mixer with Added Air. *M. H. Reich, W. K. Taft, and R. W. Laundrie (Government Laboratories, University of Akron, Akron, Ohio).*

The importance of sufficient oxygen for plastication of low temperature polymers has been demonstrated in investigations conducted at the Government Laboratories, University of Akron. Air was introduced into a laboratory Banbury (size B) at a high loading (1475 grams of polymer; about 95% capacity) during the treatment of GR-S polymers X-478, X-510, and X-530 which had been prepared at 41°F. By this means, the low temperature polymers were broken down at rates comparable to those for GR-S and GR-S-10 that had been treated similarly without air. The effect of the treatment upon the processing and physical properties of the air-softened stocks was similar to those obtained by the usual Banbury treatment of GR-S and GR-S-10.

High viscosity GR-S polymers (XP-99, X-538, and X-540; Mooney viscosities of 101 to 156 ML-4) and carbon black-latex masterbatched polymers (X-537 and X-571; greater than 175 ML-4) made at 41°F., Buna S-3 (136 ML-4), Neoprene Type W (37 ML-4), and Perbunan 26 (92 ML-4) were also treated in the Banbury with added air. The raw Mooney viscosities of these polymers were lowered to approximately 35 to 55 ML-4 within 10 minutes. Whereas the gel content of X-540 and Neoprene Type W remained about the same (less than 5%), those of X-538, Buna S-3, and Perbunan 26 were reduced from an average of 29% to less than 10% and that of XP-99 was decreased from 49 to 33%. Generally, air treatment improved the mill processing and extrusion properties of the elastomers; the compounded viscosity decreased in most cases. The processibility of the air-treated polymers of high viscosity was at least equivalent to that of untreated X-558 GR-S, a 71.5/28.5 butadiene/styrene polymer made at 41°F. to 53 ML-4 viscosity.

Consistent with the results of a previous study, the tensile strengths, at 77°F., of unaged and aged specimens were generally lowered only slightly by air-Banbury treatment, but the flex life and hysteresis of unaged and aged specimens and the abrasion resistance properties did not deteriorate significantly. The net result has been to transform these high viscosity polymers into processible stocks without sacrificing the high abrasion resistance and good tread-stock properties inherent in the high viscosity polymers.

11:30 A.M.—4—Oxygen Absorption Studies of Synthetic Rubbers in the Presence of Metal Deactivators. *J. O. Cole and C. R. Parks (Goodyear Tire & Rubber Co., Akron, Ohio).*

Recent work on the aging of synthetic rubbers has conclusively demonstrated, from oxygen absorption studies on unvulcanized polymers, that the presence of very small amounts of soluble iron compounds markedly increases the rate of oxygen absorption, and hence is detrimental to its physical properties. These results are of particular interest with respect to cold rubber, currently manufactured with polymerization recipes containing substantial amounts of iron compounds, which are contained in the final polymer.

The petroleum industry has achieved some success in minimizing the deleterious effects of copper and other metals on aging of gasoline by the addition of so-called "metal deactivating agents". These agents form stable chelate compounds with the metal which are not deleterious. Although only very limited application of this technique seems to have been made in the field of elastomers, it seemed worthwhile to determine whether such agents could be usefully applied for improving the aging of GR-S type copolymers.

The work being reported was restricted to unvulcanized polymers. Since soluble, heavy metals are to a large degree rendered inactive during the vulcanization process, the deleterious effect of a metal is much less important in GR-S vulcanizates than in unvulcanized polymers. The stability of the GR-S polymers employed was evaluated by oxygen absorption measurements during accelerated aging at 100°C. in oxygen at atmospheric pressure. In all cases the deactivating agent was added in addition to standard antioxidants.

Preliminary experiments were carried out with three commercial samples of GR-S type polymers. The samples were chosen on the basis of previous work which indicated a wide variation in stability believed to be associated with differences in the soluble, heavy metal content. The addition of 1% N,N'-disalicylidene-1,2-diaminopropane as a deactivating agent resulted in a marked improvement in stability for two polymer samples assumed to contain moderate concentration of soluble, iron and/or other heavy metals. No improvement in stability was observed for the polymer assumed to contain a high concentration of soluble, heavy metals.

By use of synthetic samples containing 10 ppm. soluble iron, added as ferretic stearate, it was found that a detectable improvement in polymer stability was obtained by addition of less than 0.1% N,N'-disalicylidene-1,2-diaminopropane, but a concentration of 0.25 to 1.0% was required to effectively stabilize the polymer. Similar results were obtained in the presence of soluble copper. From data obtained with synthetic samples containing more than 100 ppm. soluble iron it was apparent that effective stabilization of the polymer was not obtained at a deactivator concentration of 1%.

It was concluded that the deleterious effects of moderate amounts of soluble, heavy metals such as iron and copper can be largely eliminated by use of deactivating agents. The possible value of deactivating agents at high metal concentration levels has not yet been established.

A semi-quantitative comparison of the relative effectiveness of N,N'-disalicylidene-1,2-diaminopropane as a deactivator for copper and iron was made at a soluble metal concentration of 10 ppm. in a GR-S-10 polymer containing 1.2% N-phenyl-beta-naphthylamine as antioxidant. The deactivator was found to be slightly more active for copper than for iron.

Data on the effect of chemical structure on deactivator efficiency are reported. Compounds obtained by condensing amines with o-hydroxy aromatic aldehydes and o,o'-dihydroxy asobenzene derivates show deactivator activity for iron.

Monday Afternoon—September 10

G. F. Bloomfield, Honorary Chairman
W. A. Gibbons, Presiding

2:00 P.M.—5—Studies on the Vulcanization and Structure of Polyacrylic Rubber. *S. T. Semegen (B. F. Goodrich Research Center, Brecksville, Ohio).*

Early approach to the vulcanization of polyacrylate rubber is discussed. Curing agents found and their effect on physical properties are noted.

This paper discusses strictly the mechanism of vulcanization of polyacrylate esters induced with sodium m-silicate, and to a less extent with lead oxide. Vacuum distillation at curing temperatures of the rubber, the rubber plus curing agents, and the cured rubber was conducted. Analysis of the distillates revealed evidence of alcohol liberation, probably through hydrolysis, culminating either in a Claisen type condensation or hydrogen binding of the polyacrylic acid.

X-ray and electron diffraction methods were used to show main chain spacings, side chain spacings, neighbor C-C carbon spacing of some acrylates and methacrylates, including methyl, ethyl, propyl, isobutyl, and n-butyl.

Comparisons of the side group and main chain spacings were made by X-ray of the various esters of polyacrylic acid and α-carboxy pimelic acid, from methyl ranging to 2-ethyl hexyl. The patterns are strikingly similar. The side group spacing progresses uniformly from 7.6 Å for methyl acrylate to 12.4 Å for n-butyl.

The binding in polyacrylic acid and α-carboxy pimelic acid is much stronger than that of the esters. Also, hydrolysis of the methyl acrylate leads to an increase in side group spacing.

Polyacrylic acid shows a marked change in structure when plasticized with water or alcohol. The hard, brittle acid becomes rubbery, while X-ray pattern indicates the strong hydrogen binding between side chains has been broken up by association with water or alcohol.

Vulcanization of polymethylacrylate showed by X-ray that the interchain spacing increased from 7.6 to 8.4 Å. A copolymer of methyl acrylate - acrylic acid (10%) plasticized with methanol showed a spacing of 8.6 Å, although the unplasticized copolymer was actually lower at 6.7 Å. This shows the vulcanization to proceed by controlled hydrolysis followed by hydrogen binding. Such a mechanism should be sensitive to moisture in agreement

with the fact that anhydrous sodium silicate will not vulcanize, and that cured polymers are affected by moist heat.

Slides are presented for the following X-ray diffraction patterns: (1) Polymethyl acrylate; (2) Polyethyl acrylate; (3) Poly n-propyl acrylate; (4) Poly n-butyl acrylate; (5) Polyisobutyl acrylate; (6) Poly 2-ethyl hexyl acrylate; (7) Polyacrylic acid; (8) Polyacrylic acid plasticized with water; (9) Polyacrylic acid plasticized with methyl alcohol; (10) Polyacrylic acid plasticized with ethyl alcohol; (11) α-carboxy pimelic acid; (12) Tri-methyl α-carboxy pimelate; (13) Tri-ethyl α-carboxy pimelate; (14) Tri-n-propyl α-carboxy pimelate; (15) Tri-n-butyl α-carboxy pimelate.

2:20 P.M.—6—Synthetic Rubber Latex Developments. *L. H. Howland, V. C. Neklutin, R. W. Brown, and H. G. Werner (U. S. Rubber Co., Naugatuck, Conn.).*

This paper discusses new developments in cationic latices, volatile base latices, and fixed base "cold" latices of the butadiene-styrene copolymer class.

Concerning the acid side latices, some rather interesting products have been made at both high and low temperatures. The best of these uses a tallow amine salt as the emulsifier. Others have been made with rosin amine acetate emulsification.

Due to requests from industry, several volatile base latices have been made by both high and low temperature polymerization. The simplest to manufacture is one made to 49.5% solids at elevated polymerization temperature, which uses morpholine laurate emulsification. This can be stripped readily without causing floc formation.

The present demand for "cold" latices for foam sponge, tire cord treatment, certain dipped goods, and other applications, demonstrates that "cold" latex is a major advance in the latex industry. Since the first production started in 1949, several new latices have been developed, some of which are made to 60% solids by heat concentration. An improved polyamine activated (iron free) formula has been developed which should permit higher production rates than obtained with the previous ferrous sulfide activated recipe. Several modifications of this have been devised to meet demands from the trade.

2:40 P.M.—7—New Developments in Solid Phase Spectroscopy. *J. D. Sands and G. S. Turner (Polymer Corp., Ltd., Sarnia, Ont., Canada).*

Rapid methods of preparing samples for spectroscopic study in the solid phase are presented. These methods have proved effective for both qualitative and quantitative work in the elastomer field, and should have a wide range of application.

Essentially, the technique consists of laminating or impregnating the substance under study between or into sheets of other materials which have a transparent region in the infrared. Among the latter are mica, silver chloride, and polyethylene. Sample thickness is eliminated from calculations by using the ratios of absorption peaks, as measured from suitable baseline points.

One of the important applications of the technique is in the determination of acrylonitrile in nitrile-type copolymers. The time required for the entire analysis is fifteen minutes, with a probable error of one numerical per cent.

3:00 P.M.—8—Polymer Carbon and Its Derivatives. *W. O. Baker and F. H. Winslow (Bell Telephone Laboratories, Murray Hill, N. J.).*

Carbonization of organic matter is still one of the commonest chemical reactions, but it usually occurs either by partial oxidation (e.g., dehydration of cellulose or dehydrochlorination as in saran chars), as in charcoal making, or by vapor and liquid phase polymerization, as in carbon black and Glanzkohlen. Most polymers melt and volatilize on pyrolysis. However, progressive dehydrogenation of solid, highly crosslinked hydrocarbon polymers, like polydivinylbenzene and polyvinylacetylene, can be effected in an inert atmosphere. On integral pieces, this is virtually chemical modification of a single giant molecule. Enough of the original carbon bond network survives the thermal chaos (up to 1200°C.) to retain the original gross form (even as filaments) of such polymers in the final, pure "polymer carbon".

With original cross-sections greater than 2 mm., however, pieces of polymer carbon may be cracked. Non-ideal yields, meaning loss of carbon along with hydrogen, set up stresses along with a large volume shrinkage. Thus, a unit volume of original polymer (say a small sphere) goes down to over-all volume of 0.478 cc. (at 25°C.) after conversion to polymer carbon at 960°C., *without changing shape*. At the same time, it loses 52% of its weight and its He gas, or absolute, density goes up from 1.05 to 2.05. The true volume of carbon in the 0.478 cc. hence is about 0.25 cc., and the pore volume is —0.23 cc., or 48% of the final space in the carbon sphere. This empty space thus relates roughly to the amount of *volatilized* material; the atomic re-arrangement shrinks the total sphere size down just in proportion to the increase in atomic density; that is, the specific volume of the *matter* in a sphere decreases by 48% while the apparent volume judged by diameter shrinkage goes down by 52%. Formation of aggregates of discrete graphite crystallites would not be expected to go this way.

These results, obtained on many individual spheres, emphasize the continuity of valence bonds through the entire particle (microgel molecules). X-ray scattering of polymer carbon suggests cross-linked graphitic layers, leading to diamond-like hardness, re-ordering or true graphitization does not occur at 2400°C.

Partially dehydrogenated derivatives form a series of organic electronic semi-conductors. With about 23 C atoms per H atom, specific resistivity at 25° C. is 1.3×10^5 ohm cm. Absorption spectra show that the electrons in the original hydrocarbon are progressively loosened, with strong color changes.

Polymer carbon is significant technically for electrical, mechanical and chemical uses of a hard, refractory, electron-microscopically smooth, geometrically regular form of carbon. Since original monomers are distilled, polymer carbon is spectroscopically pure.

3:20 P.M.—9—Behavior of Elastomers at Small Torsions. *K. H. Meyer, A. J. A. van der Wyk and W. Gonon (University of Geneva, Geneva, Switzerland).*

A novel apparatus for the study of the mechanical behavior of cylindrical specimens of elastomers at very small torsions is described. Some results are given.

3:40 P.M.—10—An Electrical Analog Method for Explaining Elastomer Behavior. *R. B. Stambaugh (Goodyear Tire & Rubber Co., Akron, Ohio).*

Mechanical models, made up of springs and dashpots in various combinations, have been useful in a conceptional way for representing the visco-elastic properties of elastomers. It has not been practical to actually construct such models and use them in an experimental way to study elastomeric response to forces. The benefits of such procedures can be secured by taking advantage of the mathematical analogy which exists between electrical networks made up of capacitors, resistors, and inductors and the corresponding mechanical systems of springs, dashpots and masses. The electrical system permits great flexibility in the construction of models because of the wide ranges of components available and the switching arrangements possible. Furthermore, the time scale for the response of the model may be expanded or compressed, and the nature and magnitude of the forces applied is nearly unlimited.

Apparatus has been assembled for setting up the electrical analog of simple linear or non-linear mechanical models. The associated equipment for exciting the model and analyzing the resulting "motion" consists of a force generator providing step-function or alternating voltages and an integrating amplifier which measures the "deflection" or electric charge on the model by integrating the current flow into it. The output of this amplifier is observed on a twelve-inch cathode-ray tube screen in the form of a plot of the model motion as a function of time and force. Additional equipment permits repetitive excitation of the model and means of checking the calibration of the equipment. The display screen is photographed for permanent records.

Typical models are described. A creep for a model of GR-S tread stock, which was obtained in a fraction of a second, represents the creep observed in the actual stock in a period of 1000 hours. A stress-strain curve from a model of natural rubber stock is shown to illustrate the use of non-linear model elements to reproduce the complete curve more accurately. The performance of rubber under vibrational forces has also been studied by this method. The possibility of applying to a model complicated force-time relationship not available for actual rubber testing indicates a particular field of use for the method.

New Type Collapsible Container Holds 10,000 Gallons

DURING World War II there was a constant cry by the military forces for the storage of petroleum products in the field. Although the conventional rigid types were available, it frequently took far too long to get them erected and into operation near front line activities. Accordingly, the Engineer Research and Development Laboratories at Fort Belvoir, Va., continued its efforts to develop a satisfactory collapsible container and has succeeded in designing one of 10,000-gallon capacity, as illustrated herewith.

Based on experience with some collapsible containers which were tried during World War II, it was decided to make a container which would be simple to make, capable of being vulcanized into a single unit, easy to carry, not damaged in storage by creasing, and capable of being installed quickly by troops in the field with a minimum of training. The container illustrated is said to meet all of these requirements.

The "pillow" container is made of nitrile rubber reinforced with inner and outer layers of nylon cloth, all formed into a 3/32-inch thick sheet. The inner layer of nylon cloth has an adhesive coat, a liquid coating of nylon to serve as a barrier to prevent porosity, and a layer of nitrile rubber which is in contact with the gasoline. The heavier outer layer of nylon cloth is impregnated with the adhesive coating and nitrile rubber in the same manner as the inner layer but without the nylon barrier. The thin coating of nylon liquid (0.0002) greatly reduces the loss of gasoline by permeation. This thin coat of nylon is equivalent to 1¼ inches of nitrile rubber in ability to stop this detrimental effect.

The number of openings into the container has been kept to a minimum since all openings are possible trouble sources. The small opening at the center top (see illustration) is not a vent but an overflow to be sure no one forgets to stop filling the container. The single 4-inch opening on the end fitted with a flexible hose is the inlet and outlet to the container. The valve is placed at the end of this flexible connection.

Tests have been made on the fabric and on the container as shipped. The tests on the fabric, using SR-6, the 40% aromatic test fluid, indicate that 0.021 ounce of gasoline will pass through one square foot of fabric in 24 hours at 75° F. temperature. Tests on the container were made by filling the container with 91-octane gasoline and checking for leaks. After a period of 30 days the container had several small "wetted" areas, but these soon disappeared. The second container test was made by leaving the container in its protective carrying box for a year and then filling it with gasoline to see if the time in storage damaged the fabric. It was found that one year's storage does no damage. Cold weather tests have indicated the container can be utilized in temperatures around —45° F.

Over-all view of the new 10,000-gallon capacity collapsible container.

The container is quickly installed by merely unrolling it like a rug from the protective box. The only requirement for installation is a flat site which is free of sharp objects. The outer and end connections are quickly bolted into place and the container is ready for service. The container illustrated was made by the Goodyear Tire & Rubber Co.

RCA Guardsman Metal Detectors

New metal detection equipment featuring four types of small-aperture inspection heads for more efficient and speedier location of metallic particles contaminating nonmetallic products has been announced by the Engineering Products Department, RCA Victor Division of the Radio Corporation of America, Camden, N. J. Designated the "Guardsman Series," the metal detectors will indicate the presence of even minute particles of metals or alloys, whether magnetic or non-magnetic, and regardless of their depth in the material, as products pass through an inspection aperture on an endless conveyor belt or by means of a chute at rates of 10 to 1,000 fpm.

The "Guardsman" detectors consist of two units. The control unit, which is the same for all models and applications, has an overall measurement of 8¼ inches high, 6¾ inches wide, and 10 inches deep. It weighs only 20 pounds. The second unit, the inspection head, is provided in four different styles to meet specialized installation requirements. Two of the box-type heads have rectangular apertures—one measuring 2½ x 7½ inches (Model MI-33432) and one 4 x 5 inches (Model MI-33434)—and are designed for detecting metal on items that can be carried on a small conveyor belt during processing. The others have smaller box-shaped heads with round apertures—one (Model MI-33441) measuring 1⅛ inches in diameter; the other (Model MI-33442) measuring 2 inches in diameter—and are suitable for liquids carried in glass tubes, cigarettes, and similar items that can pass through the small head in a nonmetallic tube or trough.

Materials passing through the inspection aperture are screened by a high-frequency electromagnetic field, generated by scientifically designed coils embedded in a water-proof material. High-frequency power is fed to the coils from a self-contained electronic oscillator, and the reaction caused when metal is present in the material being screened operates a relay which triggers either a signaling device (lamp or bell) or an automatic marking or ejecting mechanism, or a combination of these, which ever is desired. The units are marketed by Eriez Mfg. Co. of Erie, Penna., domestic and Canadian distributors for RCA metal detection equipment.

Editorials . . . . . .

Socialized Industry?

WITHIN the past few days, John L. Collyer, president of the B. F. Goodrich Co., issued a statement in which he declared that the rubber industry in the United States is today completely "socialized" in the fields of rubber supply and usage. Because of this situation, Mr. Collyer called for the appointment of a special commission to study the problem and develop a policy of competition in rubber "in keeping with the traditions and principles underlying both our domestic and foreign policies."

In making the statement, the Goodrich official, who acted as Rubber Director at one time, pointed out that the government owns the rubber producing plants, procures the raw materials and schedules production, is the only buyer and importer of crude rubber, determines the amounts of rubber that may be consumed by manufacturers, sets the specifications for the use of rubber, and determines the price. He added that "socialization" of rubber has been tolerated by the American people only because it was dictated "by military security and not by a clearly defined policy."

Mr. Collyer made a series of recommendations, on a time-table basis, designed to remove the stigma of "socialism" from the rubber field. Space does not permit a listing of these recommendations, but they touched on the purchasing of natural rubber, control over consumption, stockpiles, and control of prices. Several of these factors have occupied the attention of Washington rubber officials for some time, and activity on some of them is already in the hopper. For example, it is believed that steps have already been taken for the General Services Administration to relinquish its reins on the purchase and importation of natural rubber by year-end. Furthermore, a definite goal on stockpiling has been set, and is believed to be nearing completion. Once this goal has been reached, the government is expected to relax its over-all controls.

Mr. Collyer seems most concerned with the establishment of a definite policy on rubber for the United States. On this score he will find supporters by the thousands, including this column. With his usual foresight, Mr. Collyer has his eye on the present Rubber Act, which became law in April, 1948, and which expires on June 30, 1952. If the setting up of a special commission, similar in character to the Baruch Committee on Rubber, will result in a clear-cut policy decision for this country, then we, too, would like to see the formation of such a committee.

Continued Improvement

THE steady growth in the production of GR-S, in accordance with the government's planned program, has been reflected in the latest NPA directive which permits small consumers to use up to 150,000 pounds of rubber a quarter, regardless of the company's base period consumption. The rubber required to meet this easement will amount to approximately 1,500 tons per month. The fact that this additional amount will consist entirely of synthetic rubber is indicated in the amendment permitting the easement, the amendment stating that small companies may not use more natural rubber than they have been using in the past. For the records, the amendment also states that small companies may not increase their use of rubber for the production of items listed in Appendix B of the rubber order.

Production of GR-S has been climbing steadily since the first of the year. January production amounted to 46,188 long tons, jumped to 53,061 tons by March, and reached 54,081 tons in May, the latest official figure. Total production of synthetic rubber increased from 58,027 long tons in January to 65,433 tons in May. There is every likelihood at present that the over-all monthly production rate will hit 72,000 long tons within the next few months. There is a good possibility that the production of GR-S alone will achieve a monthly rate of close to 70,000 tons before the end of the current year, this rate being attained through the boosting of present facilities and the elimination of production bottlenecks.

Rubber Benefits

THE price of natural rubber has stayed at fairly high levels for the past year and there has been the usual amount of griping on the part of consumers. That some good has resulted from this situation was indicated in a recent talk made by Mr. H. B. Egmont Hake, prominent British rubber producer. Mr. Hake pointed out that the higher price has accomplished the following: It has been a major factor in enabling Great Britain to suspend Marshall aid; it has lifted the Malayan Treasury from stringency to comfort; it must have helped, if anything could help, to save Indonesia from collapse if not from anarchy; it has turned hundreds of thousands of peasant owners into small capitalists, the surest safeguard against the agitator. There are still two sides to every story!

CURRENT NEWS OF THE MONTH

NPA LIFTS BAN ON SPARE PASSENGER TIRES AND GRANTS SMALL COMPANIES MORE RUBBER

THE National Production Authority in an amendment to Order M-2, dated July 17, lifted the ban on spare tires for new passenger automobiles. NPA also revised Order M-2 to permit greater use of rubber by small manufacturers. This was done by raising the permitted use of rubber by small users from 25,000 to 150,000 pounds a quarter, regardless of a company's base period consumption. It will result in some increase in the supply of rubber products for civilian use, NPA said. NPA had previously announced that it was considering revocation of the spare tire ban because the steel shortage has reduced production of automobiles in the third quarter. With fewer cars being made, fewer tires will be needed for them, NPA explained.

In the second quarter of 1951, NPA pointed out, the automotive industry produced 1,500,000 cars, which, with four tires to the car, meant 6,000,000 tires were needed. In the third quarter, with production estimated at 1,200,000 automobiles, provision of five tires to the car will mean a total of 6,000,000 tires, the same as in the second quarter.

Restoration of the spare tire as original equipment on new cars could mean a saving to the public of as much as $15,000,000 during the third quarter, NPA estimated. During the ban a purchaser of a new car had to buy a fifth tire on the open market paying considerably more for it than when the spare was included as original equipment with a new car.

The spare tire was banned in April and the amount of rubber that would have been used for that purpose was channeled into production of heavy-duty tires for trucks, tractors and farm equipment. A serious shortage had developed in these lines, threatening to disrupt transportation and interfere with farm production.

Heavy-Duty Tire Production

Immediately after the spare tire ban went into effect, production of heavy-duty tires increased 35,000 units a week and greatly relieved the situation. The July 17th amendment requires tire manufacturers to continue this accelerated rate of heavy-duty tire production by specifying that they must make as many of these tires in the third quarter as they did in the second quarter. This can be done, even with the lifting of the spare tire ban, because the same amount of rubber will be available to them for that purpose, NPA explained.

As for the effect of the July 17th amendment upon small manufacturers of rubber products, NPA said they will be allotted about 1,500 more tons of rubber a month, which will be provided by increased production of synthetic rubber. Small companies heretofore had been permitted the use of up to 25,000 pounds of rubber a quarter regardless of the amount they had consumed during the base period. The increase to 150,000 pounds a quarter is part of the government's policy to aid small business wherever possible.

According to NPA, there were 384 small rubber users qualified to use up to the 25,000 pound limitation. The latest change brings in an additional 295 producers. NPA said these 679 users consume less than 5% of the total available rubber supply.

Total Monthly Consumption

The consumption of 1,500 additional tons of rubber a month will bring the total consumption of rubber for civilian use to almost 100,000 tons monthly, or enough to assure an adequate supply of virtually all types of rubber products, NPA said. A small company, however, may not use more natural rubber than it has been using in the past, nor may it increase its use of rubber for the production of Appendix B products.

Appendix B products are less essential ones, such as bowling balls, bathing caps, athletic goods and replacement tires and tubes for automobiles, bicycles and motorcycles. All manufacturers are limited to 90% of their base period rate of production of Appendix B products. The small user is also prohibited from reselling rubber compounds to other manufacturers of rubber products.

Synthetic Production Gains

According to a report by the Natural Rubber Bureau, production of GR-S is on the up-swing and should clear 72,000 tons monthly. Butyl output, hampered by equipment troubles, is seen falling below earlier estimates, the Bureau said. Although there is considerable discussion in Washington on increasing butyl production, the report stated, no official commitment has been made.

While the government has also made no announcement of its intent to augment existing GR-S production capacity, the report said that "plans are well underway to increase capacity to around 860,000 tons per year from the existing 756,000 tons. These plans do not include any ground-breaking for new plants, but will concentrate on boosting present facilities and wiping out production bottle-necks.

Alcohol-Butadiene Plants

Alcohol-butadiene plants, the report said, are running at full capacity and should produce 16,000 to 18,000 short tons this year. Another 40,000 to 43,000 tons of butadiene is expected from petroleum installations which will be aided by the new catalyst developed by the Dow Corning Co. This catalyst is claimed to be 20 to 25% more efficient than types now in use, the report stated. Although it has not been confirmed, the Natural Rubber Bureau report said, an additional 100,000 tons of polymer capacity can be installed for $4,500,000 to $6,000,000.

Cold rubber capacity of government-owned plants is estimated at 415,000 tons yearly, the Bureau estimates. If the 860,000 ton rate is achieved, this will bring the cold rubber capacity to about 49% of the total program, the report stated.

The Bureau also noted that officials of the Office of Rubber Reserve recently concluded negotiations for a supply of benzene from Germany which will considerably boost supplies of this raw material for styrene. ORR is further stretching its styrene supply by reducing the amount of bound styrene from 20 to 23½%. This, the Bureau said, applies to nearly all polymers.

Senate May Resume Hearings

The Subcommittee on Rubber of the Select Committee on Small Business of the United States Senate may resume hearings in Washington, D. C., on the question of small rubber firms participating in the government's synthetic rubber program. The subcommittee wants to find out if the smaller firms have been squeezed out of the operating program. The subcommittee was said to be especially anxious to check on reports that the large firms of the industry were getting more than their share and at the expense of the smaller companies.

Senator Guy M. Gillette (Dem., Iowa), chairman of the subcommittee, stated the recent NPA order easing allocation of rubber to small firms was the result of the work of this group. He estimated the order will assist the smaller rubber com-

panies in equalizing the hardships of the base period heretofore established.

The synthetic rubber program was given further impetus when the Office of Price Stabilization, on July 26, decided that the Office of Rubber Reserve could go ahead with contracts to buy materials or services for the synthetic rubber program at prices that were being negotiated when OPS issued its general freeze order. The relaxation is contained in Amendment 2 to General Overriding Regulation 2, effective July 31.

Much of ORR's synthetic rubber purchase program is conducted on a cost-plus-fixed-fee basis, OPS noted. Because of complexity of arrangements under the program, ORR was unable to make all of the necessary adjustments of existing contracts between the time Congress extended the Rubber Act on June 24, 1950, and the issuance of the General Ceiling Price Regulation on January 26, 1951.

OPS's July 31 order stipulates that prices determined by cost-plus-fixed-fee or other contracts which were either executed or in the process of negotiation by ORR before or during the GCPR base period, December 19, 1950 to January 25, 1951, shall be the ceiling prices for sales to ORR.

Other News of Interest

NPA has told the Flexible Plastic Container Industry Advisory Committee that a greater supply of polyethylene is expected to be available in September, because of increased production, and that the packaging industry can expect a larger allocation for essential packaging purposes. The committee reviewed polyethylene allocation procedures and said their quotas, historically based, are inadequate to meet requirements.

According to the Oil & Chemical Products Co., its toluol plant is now in full production. It is hoped that the company's new production will help ease the shortage of the material. The company recently completed a large refinery and plant located at Houston, Texas.

Trade sources in Washington, D. C. state that NPA may soon free the chemical industry from filing a heavy load of priority-rated orders and give the industry at least a trial run with a broad gauged voluntary allocation program. Such a step, almost completely removing the industry from the impact of the Controlled Materials Program, has been indorsed by the agency's Chemical Division. It will come up for review in a few weeks with chances that it will be adopted.

Swan Rubber Increases Stock

Approval of a management proposal to increase the common stock of the Swan Rubber Co., Bucyrus, Ohio, from 200,000 shares to 800,000 shares was recently voted by the company's stockholders. The action will give present stockholders a dividend of three shares for each share they now hold. The company is also planning a 20% increase in dividends with the present quarter. The increase will bring the annual dividend to $3.60 on present shares.

Agricultural Specialists Needed

Six hundred agricultural specialists are needed to represent this country abroad in technical cooperation programs, including the Point Four program, under present plans of expansion, the U. S. Department of Agriculture announced recently. The program requires employees with professional academic training and several years of responsible professional experience in the field of agriculture. Areas into which the specialists will be sent include Europe, Latin America, Africa, the Near East and the Far East. Persons interested in applying for a Point Four position overseas should complete Standard Form 57 (Application for Federal Employment) and return it to: Parke G. Haynes, Chief, Division of Employment, Office of Personnel, U. S. Department of Agriculture, Washington 25, D.C.

Infringement Suit Dismissed

Manufacturers of foam rubber shoulder-pads have been freed of a major obstacle in expanding their market by a decision of the Federal Court dismissing a patent infringement suit brought against them. The suit, which was instituted in May, 1949, had been one of the causes of liquidation of twelve manufacturers of shoulder pads, according to Simon Kagan, president of the Seely Shoulder Pad Corp., one of the defendants. Other defendants in the suit included the International Latex Corp. and R. H. Macy & Co., Inc. Mr. Kagan predicted that many additional chain store outlets would be offering foam rubber pads now that the threat of the infringement suit had been eliminated. Many large manufacturers would now be able to re-enter the field, he said. Mr. Kagan stated that his own company produced about 10,000,000 shoulder pads of all types annually. The suite was initiated by the E-Z Thread Co. of New York.

Correction

The American Society for Testing Materials has made an important correction in an article covering emergency alternate provisions in the Tentative Specifications for Friction Tape for General Use for Electrical Purposes (D 69-48 T) which would modify the number of maximum permissible pinholes in the tape. Unfortunately, two columns of data, as submitted by ASTM and published in the July issue of RUBBER AGE, were reversed. This is the correct information.

Tape—Width In.	Number of Pinholes Max. Current Standard	Number of Pinholes Max. Emergency Provisions
¾	6	12
1	8	16
1¼	12	24
2	16	32

CHEMISTS TO HOLD CONCLAVE IN NEW YORK IN SEPTEMBER

Eighteen thousand chemists and chemical engineers from 42 countries will convene in New York City on September 3 for a two-week World Chemical Conclave. The Conclave will open with the Diamond Jubilee Meeting of the American Chemical Society and will include the Sixteenth Conference of the International Union of Pure and Applied Chemistry and the Twelfth International Congress of Pure and Applied Chemistry.

President Truman has been invited to speak at the ACS Diamond Jubilee banquet at the Waldorf-Astoria on Wednesday night, September 5. Governor Alfred E. Driscoll of New Jersey will be the principal speaker at a general meeting of the Society in Manhattan Center on Monday evening, September 3.. The week of the Society's Jubilee Meeting has been designated as National Chemistry Week, and observances stressing the contributions of the chemist and chemical engineer to better living have been scheduled in communities from coast to coast by the Society's 138 local sections.

Technical sessions of the Jubilee Meeting will begin on Tuesday morning, September 4, and will take the form of symposia sponsored by the Society's twenty scientific and technical divisions. Among the varied symposium themes are synthetic rubber, the origin of petroleum, and frontiers in biochemistry. More than 700 papers will be presented at a total of 80 symposia which will be held in nine New York hotels. The Hotel Statler will be the general headquarters for the meeting and for the two international meetings to follow.

Diamond Jubilee programs of many types, in addition to exhibits, have been planned by the local sections outside New York. Public lectures and forums on the contributions of the chemist and chemical engineer to modern civilization, school assemblies, and local Jubilee stamp ceremonies are among the activities scheduled.

Brandes Announces Retirement

Dr. Elmer W. Brandes, leading plant pathologist, retired from the U. S. Department of Agriculture on July 31. For seven of the more than thirty years of crop improving scientific work he headed the Division of Rubber Plant Investigations as well as the Division of Sugar Plant Investigations. Born in Washington, D. C., Dr. Brandes took his scientific training at the Michigan Agricultural College, the University of Michigan, and Cornell University. One of his outstanding accomplishments was the guidance of research on leaf disease of the Para rubber tree. His personal research achievements are numerous and important. They include the creation of mosaic resistant hybrid sugarcanes used throughout the world and the combining of tropical and temperate zone species by breeding to make a new type of sugarcane adapted to subtropical conditions in the Southern states. Dr. Brandes is the author of scores of government scientific reports and bulletins, and articles in scientific and trade journals.

ALL CIVILIAN NEEDS TO BE MET BY 1953 SAYS U. S. RUBBER HEAD

Harry E. Humphreys, Jr., president of the U. S. Rubber Co., stated recently that at the end of 1952, even allowing for military production needs, this country "should still be able to turn out about as many civilian goods as it did before the start of the defense program." He spoke at the opening of the thirty-second annual meeting of the Southern Industrial Relations Conference, attended by 700 supervisors and executives throughout the southern states.

Industry is being called upon to supply a military force only one-fourth as large as that in the last world war, Mr. Humphreys noted, and to perform this job it has a manpower and factory capacity in the neighborhood of 13,000,000 workmen compared with less than 9,000,000 in 1940. By the end of next year, Mr. Humphreys declared, this country will have completed a twelve-year period in which its investment in industrial plant will have doubled.

In addition, Mr. Humphreys said, nearly 2,000,000 more people will be added to the country's labor force in the next eighteen months, and if all-out war does not envelop the world we can expect the armed services to require not more than 3,500,000 men. Mr. Humphreys also suggested that industry's organizational charts be rewritten so that the worker on the production line would be given a priority rating over supervisors and management representatives.

"After all, it's the people on the production line who really get the work done," Mr. Humphreys said. "The rest of the organization is just so much useless overhead, unless it can help the man at the machine to work more effectively. Sometimes I think we draw our organization charts upside down when we put the high-salaried people at the top. It tends to make us think that it is the job of the people under us on the chart to support us."

Plan Phthalic Anhydride Plant

The Barrett Division of Allied Chemical & Dye Corp. has applied for a Certificate of Necessity covering the construction of a new plant at Philadelphia, Penna., where it is planned to produce 36,000,000 pounds of phthalic anhydride annually. The new Barrett plant will involve an expenditure of about $3,500,000 and will include equipment of the most modern character. The plant is expected to require about one and one-half years for construction.

Swift Plans New Adhesives Plant

Swift & Co. has announced plans to construct a new industrial adhesives plant and laboratory adjacent to its present installation at New Orleans, La. The new, one-story building is expected to be in operation by late autumn. Plans call for the production of several million pounds of adhesives yearly. Dextrine, animal glues, resins and rubber-based products will be manufactured at the new plant.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation, since publication of those in our previous issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue. Normally, experimental polymers will be produced only at the request of the consumers and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside if possible for distribution to other interested companies for their evaluation. The 20 bales when available will be distributed in quantities of one or two bales upon request to the Sales Division of Rubber Reserve or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received to warrant them.

X No.	*Polymer Description*
X-651 GR-S	The same as X-579 masterbatch, except that Sterling SO replaces Philblack A.
X-652 GR-S	A masterbatch of 100 parts of GR-S-X-647 and 70 parts of EPC black. Stabilized with 1.25% BLE on the unpigmented polymer.
X-653 GR-S Latex	Polybutadiene latex polymerized by the Type V latex technique. Total solids 55%.
X-654 GR-S	An oil-rubber masterbatch identical with X-628 except that 25 parts of Shell SPX 97 are used in place of Circosol-2XH.
X-655 GR-S	Butadiene/styrene charge ratio 75/25 adjusted to give 20 ± 1% bound styrene, polymerized at 122° F.; emulsified with Rosin Soap L.M. 2.19.0.1 or L.M. 2.19.0.3; shortstopped with sodium dimethyl dithiocarbamate alone or with sulfur as sodium polysulfide; stabilized with 1.25% PBNA on the rubber. Mooney viscosity 54 ± 4.
X-656 GR-S	Same as X-608 masterbatch except shortstopped with sodium dimethyl dithiocarbamate and Polyamine-H.

Please Note Changes Made in the Following Experimental Polymers

X-634 GR-S	Number canceled.

In all 41° F. experimental solid polymers, sodium and potassium Rubber Reserve soaps are interchangeable on an equimolar basis.

For all low temperature experimental polymer and latex formulations the following change applies: In all experimental polymers where rosin soap is the emulsifier, delete the trade-name "Dresinate" and insert "Dehydrogenated (Disproportionated) Rosin Soap, L.M. 2.19.0.1 or L.M. 2.19.0.3."

NOTE: The above new polymers are experimental only and the Office of Rubber Reserve, Reconstruction Finance Corporation, does not make any representation or warranties of any kind, express or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

Ford Plantation Up for Sale

The 70,000 acre Georgia plantation, Richmond Hill, acquired by the late Henry Ford when he was interested in the possibilities of producing natural rubber from goldenrod, has been put up for sale by the Ford Foundation and will be liquidated if a price satisfactory to the foundation can be obtained. The plantation is along the Ogeechee River, about 20 miles south of Savannah, and has as its most valuable asset between 45,000 and 50,000 acres of timber, which representatives of the foundation feel could be made into a highly profitable development. Besides the timberland, the plantation includes hundreds of acres of swamps and old rice fields as well as other acreage suitable for farming, which Mr. Ford had once intended to use in his natural rubber experiments.

Purchases Testworth Equipment

Southern Latex Corp., Austell, Ga., has purchased the compounding equipment in the Dalton, Ga., plant of Testworth Laboratories, Inc. Southern Latex will install the equipment in its own plant at Austell. Testworth Laboratories' Dalton property will be used as a warehouse and a distribution point for products manufactured in that company's main plant at Columbia City, Ind.

Additional Shares for Goodyear

Goodyear Tire & Rubber Co., Akron, Ohio, has made application with the New York Stock Exchange to list 2,267,699 additional shares of common stock. On June 25, directors authorized a two-for-one split of the common stock to become effective on August 15.

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RUBBER SECTION OF NSC PLANS PROGRAM FOR OCTOBER MEETING

The Rubber Section of the National Safety Council has completed its program plans for the meeting to be held in Chicago, Ill., on October 9 and 10, 1951. The meeting will start on Tuesday afternoon, October 9, with a report on sectional activities by Stanley Wright (Inland Mfg.). This will be followed by a report on Rubber Section statistics by Dr. C. E. Frick, (Van Cleef). Two papers will be presented at the session: "New Developments in Rubber Reclaiming Safety," by A. J. M. Kerrigan (U. S. Rubber Reclaiming), and "A Plant Manager Looks at His Safety Program," by R. V. Righter (GMC).

The afternoon session on Wednesday afternoon, October 10, will commence with a report of the Nominating Committee, presented by R. A. Bullock (Corduroy Rubber). Next, a symposium on "Safety in the Rubber Industry" will be held. A series of papers will be presented at the symposium. The papers are: "Solvents," by W. J. Dooling (Hood Rubber); "Control of Chemicals in the Rubber Industry," by F. W. Sands (U. S. Rubber); "Control of Static Electricity," by J. L. Shiflett (Goodyear); "Conveyors and Blenders," J. L. Dean (Firestone); "Power Trucks," R. S. Farnum (U. S. Rubber).

The session will conclude with the showing of a safety film produced by the Goodyear Tire & Rubber Co. R. W. Fickes (Goodyear) will present the film.

Pittsburgh Coke Forms New Units

Pittsburgh Coke & Chemical Co., Pittsburgh, Penna., has announced the formation of a new Fine Chemicals Division, with an anticipated manufacturing program that includes a selected range of pigments, dyestuffs, intermediate products, textile auxiliaries, pharmaceuticals, etc. Dr. L. D. Barrick has been named manager of the new division with R. M. Locke as assistant manager. Pittsburgh Coke has also announced completion of the first major unit of its new central research laboratories at Neville Island, near Pittsburgh. The new unit more than doubles the company's available laboratory space and centralizes a number of research groups previously located at different points on Neville Island.

Expands Silicate of Soda Plant

In order to meet increasing demands from the adhesives, detergent, soap and textile industries, the Diamond Alkali Co. has announced plans for an expansion project at its silicate of soda plant at Dallas, Texas. This is the fourth time in ten years that the plant has been expanded to meet growing demands. The new project, estimated to cost several hundred thousand dollars, calls for the installation of a large furnace to supplement the production of three smaller-type furnaces now in operation. The present furnace building will be remodeled to accommodate the expanding facilities.

Coming Events

Sept. 3-7. American Chemical Society, 75th Anniversary Jubilee Meeting, New York.

Sept. 5-7. Rubber Division, A.C.S., Commodore Hotel, New York, N. Y.

Sept. 10. Section on Elastomers and Plastomers, 12th International Congress of Pure and Applied Chemistry, Hotel McAlpin, New York, N. Y.

Sept. 28. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.

Oct. 5. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 8-12. National Safety Council, 39th National Safety Congress and Exposition, Chicago, Ill.

Oct. 19. Akron Rubber Group, Mayflower Hotel, Akron, Ohio.

Oct. 19. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 23. Buffalo Rubber Group, Fall Meeting, Hotel Westbrook, Buffalo, N. Y.

Oct. 23. Washington Rubber Group, Annual Banquet, Cosmos Club, Washington, D. C.

Oct. 26. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Nov. 2. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Nov. 9. Chicago Rubber Group, Morrison Hotel, Chicago, Ill.

Nov. 14-15. Rubber-Stichting, International Symposium on Abrasion and Wear, Delft, Holland.

Nov. 25-30. A.S.M.E., Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Nov. 26-Dec. 1. 23rd Exposition of the Chemical Industries, Grand Central Palace, New York, N. Y.

Dec. 14. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Dec. 14. Chicago Rubber Group, Xmas Party, Morrison Hotel, Chicago, Ill.

Dec. 14. Detroit Rubber & Plastics Group, Xmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 14. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 18. Buffalo Rubber Group, Xmas Party.

Mar. 3-7, 1952. A.S.T.M., Spring Meeting and Committee Week, Hotel Statler, Cleveland, Ohio.

Apr. 30-May 1-2, 1952. Rubber Division, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.

Oct. 29-31, 1952. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Statler, Buffalo, N. Y.

BUFFALO RUBBER GROUP HOLDS GALA ANNUAL SUMMER OUTING

The Buffalo Rubber Group held its Annual Summer Outing on July 20 at the Lancaster Country Club, Lancaster, N. Y., with an attendance of approximately 85 members and guests. The program included golf, a softball game, an egg throwing contest, a baseball throwing contest and a horseshoe contest. Following the outdoor events, a steak or fish dinner was served. The Outing Committee was headed by T. T. MacConnell (U. S. Rubber Reclaiming). The committee members included: *Softball*, Ed Martin (Hewitt-Robins); *Egg Throwing*, Charles Johnson (Hewitt-Robins); *Horseshoes*, Gene Cimminelli (U. S. Rubber Reclaiming); *Softball Throw*, Ed Knechtel (Hewitt-Robins).

In the golf tournament, prizes were awarded to the following members: *Low Gross*, Carl Croakman; *High Gross*, Dick Colden; *Most 6's*, Charles Lavin; *Most 5's*, Bill Butler; *Kicker*, Herb Harris, John Kelly, Charles Lavin. The winners in the other events included:

Horseshoes, Ed Martin (Hewitt-Robins) and Lorenz Barie (U. S. Rubber Reclaiming); *Egg Throwing*, Paul Sick (Hewitt-Robins) and Al Shor (R. T. Vanderbilt); *Baseball Throwing*, Ray Lowry (Hewitt-Robins). The winner of the softball game was a team composed of "out-of-towners."

Plans Special Meeting Program

American Cyanamid Co. has arranged a special program at the Hayden Planetarium of the American Museum of Natural History in New York during the 75th Diamond Jubilee meeting of the American Chemical Society and the International Congress of Pure and Applied Chemistry. Members and guests attending the 75th Diamond Jubilee taking place from September 3 through 7 and the International Congress the following week, September 10 through 13, have been invited by American Cyanamid to a special presentation relating chemistry to astronomy. The lecture demonstrations have been scheduled for the following dates: September 4 at 9:00 P.M.; September 6 at 4:00 P.M. and 9:00 P.M.; September 7 at 11:00 A.M.; and September 11 at 9:00 P.M.

Rubber Production in Costa Rica

Native rubber production in Costa Rica may soon suffice for that country's total needs, according to *La Republica*, a newspaper published in San Jose. Of 167,000 pounds of raw rubber used in the first six months of 1950, 118,000 was grown within the country. Costa Rica has flourishing tire recapping and rubber shoe sole industries but does not yet make complete tires. Exports of 25 tons of rubber a month were attained in the latter part of World War II, after plantations were started in the Atlantic zone. After the war, however, they dwindled to nothing. Trees are now being cultivated again and an 11 ton sample shipment was exported to the United States in April.

OPS ANNOUNCES NEW CEILINGS FOR WIDE RANGE OF RUBBER PRODUCTS

The Office of Price Stabilization has announced industry-wide percentage cost adjustment factors for an important list of rubber products which manufacturers will apply to their own appropriate base period prices in determining their new ceilings. Factors are set forth for 112 different categories and product lines in Amendment 1 to SR 8, CPR 22, effective August 13, 1951. These factors are added to the list of 15 categories already appearing in SR 8 to CPR 22, the Manufacturers' General Ceiling Price Regulation.

The effect of applying the new factors will be mixed, yielding some rollbacks and some roll forwards from ceilings under GCPR, and in some instances continuing GCPR prices. The industry-wide factors represent weighted averages of the individual manufacturers' factors determined under CPR 22, and were developed from different base periods for different products. Some of the factors are applied to base period prices and others adjusted so they may be applied to GCPR prices.

In cases where products include substantial portions of natural rubber, namely latex foam, chemically blown sponge, and camelback and tire repair materials, the factors have been adjusted to reflect the cut in the prices of natural rubber announced by the General Services Administration, which became effective on July 1.

Cost adjustment factors are included in the amendment for the rubber products appearing in the table on this page. Whether application of the factors will result in rollbacks, roll forwards, or no change in new ceilings as compared with GCPR ceilings is also indicated.

Coated Fabrics Prices

On July 23, OPS announced optional alternate methods of computing increased labor and material costs for coated fabrics under the Manufacturers' General Ceiling Price Regulation, CPR 22. The alternate methods are set forth in SR 11 to CPR 22, which became effective on July 23 for manufacturers who, under the terms of General Overriding Regulation 13, were already pricing under CPR 22. For other manufacturers the supplementary regulation is effective whenever CPR 22 becomes effective for them.

The new supplementary regulation permits the manufacturer to exclude the cost of the fabric in computing the proportion of his labor costs to the total volume of his business, and to figure his material cost increases separately for fabric and coating.

Coated fabrics manufacturers fall in three classes, the manufacturer who buys the textile and coats it, the manufacturer who coats a textile he does not own in an operation known as job coating, and the manufacturer who produces a sheeting of rubber or plastic without a supporting textile, known as unsupported sheeting. Many manufacturers perform all three types of operations in a single plant. The proportionate volume of the various operations may vary greatly from one interval to another. Moreover, the cost relationship between the fabric and the coating may vary greatly from the one item to another, depending on the textile used and the kind and thickness of the coating.

The optional alternate methods of computation will provide manufacturers under certain circumstances with a more realistic means of relating their increased costs to the operations they perform. The regulation also provides an additional method of determining textile costs based on prices offered by regular suppliers in the trade.

Mechanical Rubber Goods

Members of the Molded, Extruded and Lathe Cut Rubber Goods Industry Advisory Committee, on August 2, discussed with OPS officials the provisions of the new Defense Production Act as it applies to their industry. For the most part it appeared it would effect little change on the pricing devices now available to this branch of the rubber products industry.

Certain standard products in the industry are now subject to price control under Amendment 1, SR 8, CPR 22, which sets forth industry-wide percentage cost adjustment factors which are applied to individual manufacturers' base period prices. Other products are subject to pricing under CPR 22 formulas, unless sales of the respective items were under $10,000 during the 2nd quarter of 1951, in which case manufacturers have the alternative, as provided under SR 10 to CPR 22, to price under the General Ceiling Price Regulation, GCPR.

Committeemen said they desired a tailored regulation to cover the products of their industry not priced under SR 8 to CPR 22. These are mostly custom made products sold on a bid basis to other manufacturers. Committeemen said they desired a method of pricing these items by formula similar to the provisions of old OPA MPR 149. They volunteered to report their pricing methods to OPS so the latter can work out a suitable formula regulation. In general, it was proposed to price such products on the basis of each manufacturer's pricing method in effect during a determined base period.

On August 1, OPS announced new ceiling prices on passenger car tire carcasses, of $3.50 retail, and $2.60 wholesale. The new ceilings are set forth in SR 49 to GCPR, effective August 6, 1951. The new regulation, OPS said, will make no change in the general level of ceiling prices either for carcasses or for recapped and retreaded tires, but will merely level off certain disparities. Studies are being made by OPS to determine dollars and cents ceiling prices on other types of basic tire carcasses, such as truck and bus tire carcasses.

Tire Mileage Service

OPS also announced a new ceiling price regulation covering tire mileage service, CPR 64, effective August 6. The regulation applies to the service supplied by contractors, usually tire manufacturers, to bus and taxicab operators, based on a price per tire mile. The supplier ordinarily retains title to the tires and tubes and supplies such services as inspection, mounting and repairing.

Under the new regulation, the supplier determines his ceiling price individually for each of his various customers by reference to contracts in effect during December 19, 1950, to January 25, 1951, but the regulation requires him to adjust his prices to reflect subsequent increases or decreases in the cost of rubber, rayon and cotton.

OPS Percentage Cost Adjustment Factors

Categories or Product Lines	*Roll Forward*	*Unchanged*	*Roll Back*	*Total*
Bare Rubber Thread	—	—	5	5
Adhesive Plaster, Gauze and Cotton	—	2	—	2
Rubber Flooring	1	—	—	1
Friction Tape	—	2	2	4
V-Belts	—	5	2	7
Flat Rubber Belting	2	—	7	9
Rubber Hose	8	—	15	23
Hard Rubber Rods, Sheets and Tubes	2	2	2	6
Battery Parts	3	—	—	3
Rubber Lined Tanks and Pipes	4	—	—	4
Rubber Covered Rolls	1	1	1	3
Latex Foam Sponge	7	—	—	7
Chemically Blown Sponge	8	—	—	7
Mats and Matting	1	1	3	5
Hydraulic Brake Cups, Parts and Boots	1	—	2	3
Automotive Mats	1	—	—	1
Toy and Small Lawnmower Tires	1	—	—	1
Typewriter Platens and Rolls	1	—	3	4
Industrial Semipneumatic Tires	—	—	1	1
Agricultural Semipneumatic Tires	1	—	—	1
Graphic Arts Materials	—	—	6	6
Camelback, Tire and Tube Repair Material	—	—	8	8
	42	13	57	112

OPS also announced that CPR 62, effective August 1, removes the pricing of private brand tires and tubes from GCPR, under which they had been placed since January. Manufacturers of private brand tires and tubes will henceforth determine their ceilings on the basis of cost plus a fixed markup under the terms of the new regulation. However, the price to a private brand owner may not exceed the manufacturer's price of his own brand to his lowest price class of buyer without written approval from OPS.

Reclaim and Scrap Prices

Also on August 6, OPS issued a tailored regulation for reclaimed rubber, spelling out dollars and cents ceilings on 14 major grades. The new regulation, CPR 58, also provides means for pricing other grades of reclaimed rubber and grades custom reclaiming and masterbatching and custom masterbatching. The ceiling prices for major grades are in cents per pound, f.o.b. plant, in carload lots, freight allowed in accordance with customary practice. Prices are uniform for all reclaiming centers except California, where they are lower in comformity with the market for scrap rubber. (See accompanying table for grades and prices.)

Ceiling prices for less than carload lots are determined from the spelled out prices by applying customary differentials. Ceiling prices for grades of light colored carcass reclaim below No. 1 grade are to be in line with the dollar and cent ceiling established for the No. 1 grade.

Ceilings for grades for reclaimed rubber for which no price ceilings are spelled out and for custom reclaiming, masterbatching and custom masterbatching are the prices quoted for such quantities and grades by the manufacturer in price lists in effect on December 31, 1950, or offered in writing from November 15 to December 31, 1950. For materials or services which cannot be priced otherwise, the manufacturer may propose ceilings determined by costs plus a markup not greater than the markup on comparable grades or services, subject to approval of OPS.

Method of Determining Prices

The spelled out prices were determined in accordance with the techniques set up in the Manufacturers' General Ceiling Price Regulation, CPR 22, on the basis of reclaimed rubber prices in the base period April 1 to June 24, 1950, plus material and labor cost increases computed and submitted by manufacturers under CPR 22. Increases in the cost of scrap rubber were allowed only up to the dollars and cents ceiling prices fixed by OPS for scrap rubber. The resultant prices are, for whole tire reclaim, the same as, and for natural rubber tube and light colored carcass reclaim, considerably below ceilings under the General Ceiling Price Regulation GCPR, which froze prices on January 26, 1951.

As for scrap rubber, the new ceilings are spelled out in CPR 59, effective August 6. The new ceilings represent a rollback below ceiling prices existing under the General Ceiling Price Regulation. The ceilings for scrap tires, tire parts and scrap tubes reflect present prices and the ceilings for other kinds of scrap rubber represent levels prevailing in December, 1950.

OPS Ceiling Prices for Reclaimed Rubber

Grades	*All Areas Except California*	*California*
Premium Grade of Specially Selected Whole Tire Reclaim (Specific Gravity under 1.20—plus or minus 2)	.105	.09–¼
First Line Whole Tire Reclaim (Specific Gravity under 1.20—plus or minus 2)	.10	.09–¼
Second Line Whole Tire Reclaim	.095	.08–¼
Third Line Whole Tire Reclaim	.09–¼	.085
Fourth Line Whole Tire Reclaim	.08–¼	.08
Black Carcass Type Reclaim	.14–¼	.13–¼
No. 1 Grade Light Colored Carcass Reclaim (Specific Gravity 1.25 and under)	.20–¼	.17–¼
No. 1 Select Peel Reclaim	.11–¼	.11
No. 1 Peel Reclaim	.105	.09–¼
Butyl Tube Reclaim	.145	.135
Special Purpose Natural Rubber Black Tube Reclaim	.21	.19–¼
Natural Rubber Black Tube Reclaim	.20	.18–¼
Natural Rubber Red Tube Reclaim	.24–¼	.23–¼
Natural Rubber Gray Tube Reclaim	.24–¼	.23–¼

Ceiling prices for scrap tires, tire parts and scrap tubes apply to sales to wholesale scrap rubber dealers, to consumers, and to export and import sales. Ceiling prices for other kinds of scrap rubber do not apply to sales to wholesale scrap rubber dealers, but apply only to sales to consumers and to export and import sales. The regulation permits, under certain circumstances, deliveries for a limited time at the prices provided for in contracts now outstanding.

In accordance with customary pricing patterns in the industry, the dollar and cent ceilings are based on delivered prices at the chief consuming centers. Price differentials between these centers reflect the differences in effect prior to June 25, 1950.

Members of the Polyvinyl Chloride Resin Industry Advisory Committee discussed proposals for a tailored regulation for their industry with OPS officials on July 12, but withheld recommendations on the type of regulation they prefer pending further deliberation and decision of Congress on control legislation for the coming year.

The committeemen indicated the industry would experience some rollbacks and some roll forwards under the provisions of the Manufacturers' General Ceiling Price Regulation. Their industry is subject to the latter regulation, but manufacturers had not instituted CPR 22 prices prior to June 30, when its effectiveness was suspended by Congressional action. The committeemen also said their industry customarily sold at substantially uniform prices and the effect of CPR 22 would be to disturb this uniformity, which would not be welcome.

Members discussed the possibility of adopting an industry-wide cost adjustment factor under the provisions of SR 2 to CPR 22, which would give them a uniform percentage adjustment of their GCPR prices. It was estimated the effect of this would be to give the entire industry prices at or close to the levels which presently exist.

The committeemen decided they wanted to study the application of this device and the type of information they would have to supply OPS to develop such a factor, and weigh their conclusions against the details of the expected extension of price control by Congress, before reaching a final decision.

The committee recommended that their industry be defined by OPS as including polyvinyl chloride and all polyvinyl chloride copolymer resins having essentially the same use, the copolymers containing 50 per cent or more by weight of polyvinyl chloride, sold in the forms of resins and latices and compounded products in powder or granular states, but not including other forms such as film, sheets, rods and tubes.

American Hard Rubber Stock Plan

Stockholders of the American Hard Rubber Co., meeting in company headquarters in New York, N. Y., on July 12, defeated a management-sponsored plan for recapitalization of the company. The plan, which called for reduction and eventual elimination of the $7 preferred stock and a two-for-one split of the common, was defeated by a vote of 52,212 shares to 39,490. Approval by two-thirds of each class of stock was required for passage. An opposition group of stockholders killed the proposal with proxies totaling 50,995 common shares. Some 27,588 common shares were voted in favor of the plan, along with 11,902 preferred shares. The opposition garnered 1,217 shares. Both the management and the opposition group agreed that the preferred stock should be retired, but the latter contended borrowed funds should be used, charging that the management's conversion plan would unnecessarily dilute the present common and "give the preferred stockholder more than he is entitled to." Other news concerning the company involved the sale of a building which had been used as company headquarters for 81 years, and the removal of its offices to 93 Worth Street in New York City.

AUTOMOTIVE AND AERONAUTICAL SPECIFICATIONS REVISED BY SAE-ASTM

The SAE-ASTM Technical Committee on Automotive Rubber, which is jointly sponsored by the Society of Automotive Engineers and the ASTM, has recently released a 1951 revision of the Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications. These specifications were first issued in 1943 and published under the ASTM Designation D 735 and as SAE Standard R 10. The specifications were revised in 1946 and 1948.

These specifications establish a means of classifying and describing by standard methods the many rubber and synthetic rubber compositions in use in automotive rubber products. While many industrial and mechanical goods applications also may be adequately and conveniently served by the classification system, the committee did not intend that these specifications describe compounds for tires, inner tubes, sponge rubber, hard rubber, or those prepared from latex.

In former versions of these specifications, an attempt was made to segregate natural rubber compounds from those made from GR-S. In the 1951 revision such segregation has been discontinued and rubber and synthetic rubber compositions are divided into two basic types: those requiring no specific resistance to the action of petroleum-base fluids are identified as Type R; and those requiring specified degrees of resistance identified as Type S. Type R compounds are not further described as to classes of elastomers and may be prepared using natural, reclaim, or synthetic rubber, or mixtures thereof as the base, provided the requirements of the specifications are met. The Type S compositions, which are nominally used where resistance to swelling action by oil is required, are subdivided into three classes:

Type S Compositions

Class SA compounds having very low volume swell. In practice such compounds are normally made from polysulfide-organic dihalide polymers (thiokol); Class SB compounds are characterized as having low volume swell in petroleum hydrocarbons and normally describes compounds made from copolymers containing acrylonitrile; Class SC describes compounds having medium volume swell in petroleum hydrocarbons. Such compounds are normally made from neoprene as the base material.

The specifications further provide for different grades within each class. The grades are designated by a number, representing the hardness and tensile strength properties of the stock. In addition to combining two classes RN and RS in the new Type R table, resistance to change in hardness and tensile strength properties after oven aging has been added as a basic requirement. New values for Suffix "B", compression set, have been established which require for their fulfillment the development of low-set types of compounds. In the Type S tables change in volume in both high and low aniline point oils, change in tensile strength, elongation, and hardness after aging in the air oven, and compression set have been incorporated as basic requirements. Compression set in the new tables under the Suffix "B" requirement has been reduced to require the development of stocks especially compounded to have low compression set characteristics.

Additional suffix letters are available and provide a means of specifying requirements in addition to the basic requirements and they may be applied singly or in combination in further describing any grade. This provides the consumer great versatility in describing the specific requirements for a given rubber product.

While standard numerical limits and test methods have not yet been established for all the requirements denoted by suffix letters, it is the committee's intention to provide such information at the earliest opportunity. Further work of the committee will be directed toward even greater simplification of the specification, which should result in making it even easier for the engineer to use. A practical addition to the revised specifications is a "Key Chart" with examples illustrating the use of the specifications in selecting a particular type, class, or grade.

Separate copies of these revised specifications, including a copy of the insert Key Chart, can be procured from Headquarters of the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa., at 40 cents each. Separates of the Key Chart are 10 cents each.

Largest Slope Conveyor System

What is said to be the world's longest and highest slope conveyor system is being installed for the Dominion Steel & Coal Corp., Ltd., on its iron ore properties at Bell Island, Newfoundland. The belts of this conveyor, designed and manufactured by the Goodyear Tire & Rubber Co., Bowmanville, Ont., Canada, haul ore from two and one-half miles out under the Atlantic Ocean up to the deckheads of the Island, at the rate of 1,000 tons per hour. The conveyor system, 1,733 feet high, consists of two flights each of 1,450 feet, and eight flights 1,230 feet long. Goodyear compass rope conveyor belting, 36 inches wide, travelling at 575 feet per minute, makes up the slope conveyor. It also has two underground screening, crushing and loading pocket systems, both delivering at different locations onto the same belt. The whole system from deckhead down to loading pockets is designed to be fully automatically controlled.

Calco NOBS No. 1 Accelerator

The Intermediate and Rubber Chemicals Department of the Calco Chemical Division, American Cyanamid Co., Bound Brook, N. J., has introduced a new delayed-action accelerator for natural, synthetic and reclaimed rubbers. Named NOBS No. 1, the accelerator is said to be ideal for use with reinforcing furnace blacks in tire compounding.

General Tire Buys Joseph Stokes

As briefly noted elsewhere in this issue, the General Tire & Rubber Co. of Canada, Ltd., has purchased the assets of the Joseph Stokes Rubber Co., Ltd., Welland, Ont., Canada, a wholly-owned subsidiary of the Thermoid Co., Trenton, N. J. The sale price in the transaction was not announced. It is expected that there will be no change in the Canadian company's operations or management. However, present production will be augmented with additional products now manufactured by the Mechanical Goods Division of the General Tire & Rubber Co. at Wabash, Ind. Present production at Joseph Stokes includes battery boxes, mechanical rubber goods, plastics, and other soft and hard rubber products. Lloyd R. Leaver, formerly president of Joseph Stokes, said that Thermoid, Ltd., will continue the sales of Thermoid brake linings and clutch facings through their offices in Welland. Vincent P. Reid, executive vice-president of General Tire's Canadian subsidiary, will direct the new operation which will be known as the Stokes Division of the General Tire & Rubber Co. of Canada, Ltd. According to Mr. Reid, Lloyd J. Falkenhagen will continue in charge of operations.

Rocket Planes Using Small Tires

Small tires, about the size used on a Crosley car, cushion the superfast landings of the U. S. Navy Douglas-built rocket plane which was recently reported to have flown at the highest speed and altitude ever recorded by any airplane. The landing wheel tires for the world's fastest airplane are capable of withstanding an impact load of eight tons but are only two feet by 5.5 inches and the nose wheel tire is 20 by 4.4 inches, according to the B. F. Goodrich Co., manufacturers of the tires. Pressures carried in the tires are approximately eight times those in passenger car tires and twice the air pressure ordinarily used in airplane tires. Tires small enough to retract into the fuselage of the "Skyrocket" and strong enough to withstand extremely fast landings presented a challenging assignment, Goodrich engineers disclosed. The combined weight of a landing wheel tire and tube is less than that of a 6.70 by 15 tire.

Increases Alkylamines Production

In order to accommodate increasing demands for alkylamines, Sharples Chemicals, Inc., Philadelphia, Penna., has substantially increased its productive capacity. A new unit for the production of alkylamines was completed in July and is now in operation. Sharples one of the oldest commercial producers of amines in the United States, first offered these products to industry in 1935. Since that time a broad program of expansion in the amine field has been followed. Many new amines have been added to the line and many new applications have been developed. Most alkylamines are used as intermediates, finding use in the rubber, plastics, and other industries.

SUBSTITUTES PORCELAIN ENAMEL FOR METALS IN SYNTHETIC UNIT

A finished surface of porcelain enamel has been found an ideal substitute for the non-corrosive metals such as stainless steel in the synthetic rubber processing of the B. F. Goodrich Chemical Company at their Port Neches, Texas, plant. In these days of critical material shortages, available substitutions such as this are becoming extremely important.

The porcelain enameled part reported is a stripping column tray used in series in a distillation tower where styrene is removed from synthetic latex. In the manufacture of synthetic latex, styrene is one of two monomers which react together to form the latex. All of the styrene charged is not converted into rubber so it is necessary to recover the unreacted styrene from the latex. This is accomplished by pumping the latex to the top of a distillation tower where it passes down over a series of twelve perforated porcelain enameled trays and is stripped of its unreacted styrene content by exposure to steam.

The latex forms a thin coating on the trays which progressively builds-up until the perforations are clogged which necessitates cleaning. The company reports that due to the glass-smooth surface of porcelain enamel the latex does not adhere and is removed with an absolute minimum of labor. J. E. Miller, plant manager, states that "in this corrosive service we have found porcelain enamel to be a worthy substitute for polished non-corrosive metals."

The stripping column trays are reported by the supplier, the Erie Enameling Company, to be made of ⅜-inch Armco ingot iron and coated on all surfaces with a .010-inch thickness of industrial type porcelain enamel. R. W. Brownfield of that company states that porcelain enamel is a successful substitution for non-corrosive metals because of inherent characteristics that closely parallel those of the metals. Porcelain enamel, he explains, is actually a form of boro-silicate glass and is just as inert as glass in the presence of corrosive substances. For the same reason it offers a low coefficient of friction which offers minimum adherence to plastic materials such as latex and a degree of hardness that will resist more abrasion than most steels. Where temperature or thermal shock is a factor, porcelain enamel also offers excellent performance characteristics, Mr. Brownfield states.

In its manufacture, porcelain enamel is bonded to its metal base at temperatures up to 1600 deg. F. which assures its satisfactory performance at temperatures up to this limit. Also, the cooling process following the high temperature firing provides a type of annealing action which controls internal stresses, and because the coefficients of expansion of the enamel and metal base are identical, porcelain enamel metals will withstand extreme and rapid changes in temperature.

According to the Erie Enameling Company, porcelain enamel is appearing in an increasing number of industrial applications including refinery bubble caps, conveyor tubing bends, conveyor buckets, granary chutes and liners, coal, sand and package chutes, valve internals, tank linings, distillation and pressure processing equipment, exhaust mufflers, marine parts and many others.

Asks More Funds for Guayule

President Truman, on July 26, asked Congress for $2,307,000 for stockpiling guayule seeds, establishing nurseries and further research. Most of the money sought by the President will be used by the Department of Agriculture to transplant guayule seedlings now growing on expensive irrigated land in the central Rio Grande Valley to less expensive desert tracks. Guayule is high on the government's list of strategic materials.

Increasing Latex Facilities

Latex and Rubber, Inc., Baltimore, Md., has announced that ground has already been broken for a more than 50% increase in their latex handling and storage facility in Baltimore. The expansion will provide additional underground re-enforced concrete storage tanks, rail and truck loading area, handling equipment, as well as increased administration and laboratory space. The original plant was placed in operation in 1948.

Monsanto to Borrow $66,000,000

Monsanto Chemical Co., St. Louis, Mo., has arranged to borrow $66,000,000 from six investing institutions on an issue of fifty-year 3¼% income debentures. Under the contract, the company may draw down the money at various dates through April 30, 1953. Sinking fund payments beginning after thirty years are intended to retire one-half of the issue by maturity. Money raised by the loan will be used for the company's current expansion program, which includes construction of a phosphorus plant at Soda Springs, Idaho, a plastics plant at Cincinnati and installations at Texas City, Tex., for the production of acrylonitrile, a new synthetic fiber to be produced by Chemstrand Corporation, an affiliate, from natural gas. Chemstrand is now building plants for the manufacture of acrilan, the new fiber, at Decatur, Ala., and of nylon at Pensacola, Fla.

Italian Bentonite Available

Whittaker, Clark & Daniels, Inc., 260 West Broadway, New York 13, N. Y., has announced the availability of imported white Italian bentonite in both the high gel and low gel types. On the scarce list for several years, Italian Bentonite U.S.P. finds use in the rubber and adhesives industries.

DUPONT RUBBER CHEMICALS DIVISION DEDICATES LATEX LABORATORY

A new latex laboratory, representing an increase of 100% in the company's facilities for application research in latices, was formally dedicated on July 23 by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc. The laboratory, which cost approximately $250,000, is housed in a new two-story wing adjoining the well-known rubber laboratory at Deepwater Point, N. J. In addition to all standard equipment for compounding, testing and evaluating latices, the new latex laboratory is provided with a considerable amount of special apparatus, including high shear viscometers, instruments for measuring rheological characteristics, electronic devices for determining stress-strain properties, and spray equipment for preparing samples of latex-bonded fibers. Although emphasis will be placed on the neoprene latices, attention will also be paid to natural and other types of synthetic latices. The latex laboratory covers 3360 square feet. A new paper laboratory, with 1536 square feet of space, was also recently installed at the Deepwater Rubber Laboratory.

Lees Joins Automotive Rubber

Robert A. Lees

Robert A. Lees, formerly associated with American Anode, Inc., has been appointed general plant manager of the Automotive Rubber Co., Detroit, Mich. In his new post, Mr. Lees will have complete responsibility for the operations of the company's rubber factory and all processing departments. Born in Ohio, Mr. Lees received his degree from Oberlin College where he was later appointed to a teaching fellowship. His first connection with the rubber industry was as a research chemist in Akron. Work in development, sales and production followed. During World War II, Mr. Lees served as special consultant to the Rubber Bureau of the War Production Board and more recently served with the Rubber Division of the National Production Authority. In 1946, Mr. Lees supervised the building of American Anode's west coast plant of which he was later appointed manager. He is a member of the American Chemical Society and several local rubber groups.

Goodrich Inflatable Strip Seal

One of the most difficult problems of high altitude military flight-pressurizing of the bubble-type canopy is said to have been solved with the development of an "Inflatable Strip Seal" by the B. F. Goodrich Co. The product seals in air pressure with air pressure and is designed to provide high altitude blowouts. Yet, when inflated, the seal exerts a minimum separating force between the canopy and the fuselage. Special textile fabric, rubber-coated on both sides, is vulcanized in collapsed position to a flexible rubber channel-type base. Inflated, the rubberized fabric lifts to its maximum sealing position with little or no stretching of the rubber. Sealing is practically instantaneous, with only a few pounds of pressure above that required inside the canopy. Designs of the Inflatable Strip Seal vary with each airplane model and type. They are tailored to exact specifications by Goodrich engineers.

WASHINGTON APPOINTMENTS

Erwin Vogelsang, formerly deputy director of the Tin, Lead and Zinc Division of the National Production Authority, has been named director of the division succeeding Whitman W. Hopton, who has returned to his post as assistant to the president of the Mathiessen & Hegeler Zinc Co. of LaSalle, Ill.

Melvin L. Anshen, on leave from Indiana University, has been appointed acting deputy administrator of the Defense Production Administration in charge of the agency's office of Program and Requirements. Mr. Anshen succeeds Charles E. Wampler who has returned to his post with the American Telegraph and Telephone Co.

Edward B. Arenson, president of the Toledo (Ohio) Iron and Steel Co., has been named consultant to the Production Controls Staff of the National Production Authority.

A. L. Hollis, technical manager of Plant 3 of the B. F. Goodrich Co. at Akron, Ohio, has been granted a leave of absence to fill the position of Chief of Polymer Development for the Office of Rubber Reserve.

Thomas W. Smith, Jr., president of the Sun Rubber Co., has been named to the Toy Industry Advisory Committee of the Office of Price Stabilization.

Acquires Hydraulic Press Line

Wabash Metal Products Co., Wabash, Ind., has acquired the exclusive manufacturing, advertising, distribution and sales rights of the Wabash Hydraulic Presses formerly manufactured by Laboratory Specialties, Inc., Wabash, Ind. The Wabash line of hydraulic presses manufactured in 3, 12, 20, 30 and 50 ton capacities have a wide variety of uses in the laboratory and shop particularly in the rubber, plastics and wood industries. The Hydraulics Division of the Wabash Metal Products Co. will start production immediately on the new line of hydraulic presses incorporating recent changes and improvements. Their new plant addition and facilities will be utilized for this production.

Suntone Colors Laboratory Opened

The Warwick Chemical Division of the Sun Chemical Corp., Long Island City 1, N. Y., has announced the opening of its new Suntone Colors Laboratory. The new laboratory, located adjacent to the Sun Chemical Building in Long Island City, is devoted exclusively to problems of color chemistry relating to decorative printing of plastics and textiles. These new centralized quarters, equipped with the most modern facilities, bring together a number of heretofore separately located laboratories. Products developed and controlled by this laboratory are presently being manufactured in Warwick plants in Rhode Island, New Jersey and South Carolina

Stupp Named Technical Director

Charles G. Stupp

Charles G. Stupp, formerly technical supervisor for manufacturing of the Barrett Division, Allied Chemical & Dye Corp., has been named technical director of the division succeeding S. P. Miller, who will continue with the Barrett Division in an advisory capacity. During World War II, Mr. Stupp was works manager for the division's chemical plant in Philadelphia, Penna. Mr. Stupp came to Barrett in 1916 directly from college. He was transferred to the National Aniline Co. in 1922, shortly after the Allied Chemical & Dye Corp. was formed, and returned to Barrett in 1927. Mr. Stupp was graduated from Cornell University in 1916.

Starts Full-Scale Vinyl Output

After a year of limited manufacturing of vinyl films, General Tire & Rubber Company's plastic plant at Jeannette, Penna., is preparing for full-scale production. The trade name "Luxon," already appearing in national advertising, has been chosen to cover all of the company's vinyl-type plastics. Among other "Luxon" items slated for greater production is General Tire's semi-rigid, transparent vinyl, currently being produced for government orders. With the availability of raw materials and increased facilities, General Tire expects a large distribution of this product for commercial applications. Production of rigids, both transparent and colored, for industrial uses will soon be ready for marketing, as will the output of leather-type vinyls on which production runs have already been made, the company said.

Adds to Youngstown Plant

Republic Rubber Division of the Lee Rubber & Tire Corp. has begun work on a $2,000,000 addition to its Youngstown, Ohio, plant. The 80,000 square foot, one-story structure will boost the present space at Youngstown by about 12% and increase the number of employees from 1,400 to 1,500. The project is expected to be finished in about 10 months. The new annex will make a new type of hose for jet plane fuel lines.

ASTM COMMITTEE D-11 REPORTS ON ACTIONS AT 1951 MEETING

Committee D-11 on Rubber and Rubber-like Materials of the American Society for Testing Materials has issued a report on its activities at the 1951 annual meeting of the parent society held throughout the week of June 18 at Atlantic City, N. J. It was announced by Committee D-11 that a new Subcommittee on Application of Statistical Quality Control Methods of Rubber Products was being organized.

The activities of the D-11 Subcommittee on Crude Natural Rubber have been of international interest. This is also true of the activities of the Subcommittee on Rubber Latex. One particularly interesting development is the production in Indo-China of a series of specially controlled crude rubbers which are technically graded according to viscosity and rate of cure. These rubbers are now available and are being investigated further by the committee.

Committee D-11 presented to the Society a complete set of Purchase Specifications for Gasket Materials for General Automotive and Aeronautical Purposes (D 1170-51 T). The specifications cover materials composed of natural rubber, synthetic rubber, cork, treated and untreated papers, asbestos, and various combinations of these materials. These specifications were prepared by the SAE-ASTM Joint Technical Committee on automotive rubber and represent the culmination of several years of work which involved an extensive study of a large number of gasket materials used for a variety of automotive and similar applications.

Another very important action by the Joint Committee was the completion of an extensive revision of the Tentative Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D 735-51 T). The nature of the changes in the specifications is discussed further elsewhere in this issue of RUBBER AGE.

The Joint Committee also prepared the new Method of Test for Weather Resistance Exposure of Automotive Rubber Compounds (D 1171-51 T).

Committee D-11 reported that a number of recommendations had been presented to the Society just previous to the Annual Meeting and accepted by the Standards Committee. These covered new Methods of Test for Compressibility and Recovery of Gasket Materials (D 1147-51 T), Test for Accelerated Ozone Cracking of Vulcanized Rubber (D 1149-51 T) and Tests for Discoloration of Vulcanized Rubber (D 1148-51 T). Revisions were also made in eight other tentative methods and specifications. (EDITOR'S NOTE: A full report on these specifications will be found in the July, 1951, issue of RUBBER AGE.)

Committee D-11 presented to the Society the first Emergency Alternate Provisions, under the new procedure approved by the Board of Directors. These apply to the Specifications for Friction Tape for General Use for Electrical Purposes (D 69-48 T) and for Rubber Insulating Tape (D 119-48 T). In both, the reduced allocation of crude rubber made necessary the establishment of the emergency provisions. In Specifications D 69 the adhesion test after oven aging is omitted and the permissible number of pinholes is slightly increased. In D 119 the requirement for natural rubber was eliminated and the limitations on tensile strength, elongation, and dielectric strength have been modified.

The Subcommittee on Protective Equipment for Electrical Workers, which also functions at ASA Sectional Committee J-6, submitted to Committee D-11 completely revised specifications for rubber insulating gloves. The specifications cover three classes of gloves, differing in thickness and having proof test voltages of 10,000, 15,000, and 20,000 respectively, applied for three minutes. The specifications set forth the requirements for the electrical characteristics and the mechanical strength of gloves used for protection of electrical workers from electric shock while working on energized conductors and equipment. The specifications will be submitted to the ASTM for publication and also submitted to the ASA for approval.

Seiberling Sees Adequate Reserve

J. P. Seiberling, president of the Seiberling Rubber Co., Akron, Ohio, recently stated that the government should now slow down on its stockpiling of natural rubber. Mr. Seiberling, speaking in Atlanta, Ga. at the formal opening of his company's new warehouse, stated he had been in favor of government control of rubber—up to a point. He now believes, however, that the "peril point" has passed, and that the government could cease its stockpiling program. He said that his information is that enough rubber is now on hand for a war which would last five years. Besides the immense stockpile of natural rubber, Mr. Seiberling cited synthetic production which, he said, is at 800,000 tons annually and is expected to reach 900,000 tons by the end of this year. Mr. Seiberling is confident that synthetic rubber for tires is going to improve even more and will largely replace natural rubber.

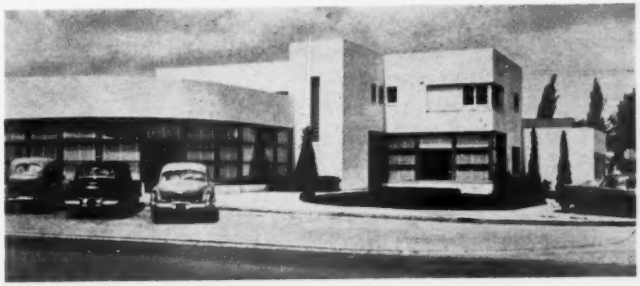
Casing Shipments Increase

According to the Rubber Manufacturers Association, shipments of automotive casings during May, 1951, amounted to 6,729,670 units, 7.58% more than the 6,255,368 casings shipped in the previous month. In May, 5,337,985 passenger and 1,391,685 truck and bus casings were shipped, compared with 4,871,589 and 1,383,779 casings, respectively, in April. A total of 7,116,173 casings were produced in May, 8.81% more than the 6,540,128 which were produced in April. Of the total casings produced in May, 5,588,198 were passenger casings, while 1,527,975 were truck and bus casings. In April, 5,108,248 passenger casings and 1,431,880 truck and bus casings were produced. As of May 31, there were 3,442,367 automotive casings on hand including 2,506,908 passenger and 935,459 truck and bus casings. As of April 30, there were 3,046,651 automotive casings on hand, including 2,254,915 passenger casings and 791,736 truck and bus casings. A total of 5,624,875 passenger and truck and bus tubes were produced in May, 1.06% more than the 5,565,700 tubes produced in April. In May, 5,585,023 tubes were shipped, .14% less than the 5,592,583 tubes shipped in the preceding month. At the end of May there were 5,070,531 tubes on hand, while at the end of April there were 4,656,998 tubes on hand.

Dow Chemical Sells Thiokol Stock

Dow Chemical Co. of Midland, Mich., has sold its 20% interest in the Thiokol Corp., Trenton, N. J., to a group of eastern investors. Leland I. Doan, president of Dow Chemical, said his firm had acquired the stock interest in Thiokol in 1939 when Dow Chemical was manufacturing a synthetic rubber used by Thiokol in special industrial and military applications. However, he added, Thiokol built its own manufacturing plant in 1948 and Dow Chemical discontinued production of the material. Mr. Doan did not reveal the cash value of the sale.

CONTINENTAL CARBON OPENS NEW CARBON BLACK RESEARCH LABORATORY



The photograph above shows the new laboratory for research on carbon black which has been completed and put into operation in Amarillo, Texas, by the Continental Carbon Co. The laboratory is designed to extend the company's facilities for the improvement of existing processes in the production of carbon black as well as experimental work on new products in the field. Research will be carried out on channel blacks, furnace blacks, and oil blacks. Witco Chemical Co. is distributor for products produced by the Continental Carbon Co.

Details on Library Appointment

Betty Jo Clinebell

As reported in a recent issue of RUBBER AGE, the Division of Rubber Chemistry of the American Chemical Society has appointed Miss Betty Jo Clinebell as librarian of the Rubber Library located at the University of Akron. In her new position, Miss Clinebell is maintaining a bibliography of current rubber literature following the classification scheme as outlined in the 1942-43 "Bibliography of Rubber Literature." Subjects of general interest to the rubber industry will be reviewed periodically and bibliographies or papers will be prepared for publication. Requests for answers to specific questions in the fields of rubber and plastics will be handled if the information is available in the literature, the Rubber Division said.

Miss Clinebell will publish a revised union list of serials in September 1951 and will reissue the union list of books by December 1951. These union lists, which have been made possible through the cooperation of the Firestone Tire & Rubber Co., the General Tire & Rubber Co., the B. F. Goodrich Co., the Goodyear Tire & Rubber Co., the United States Rubber Co., and the University of Akron, itemize all journals available through the Rubber Library. The initial union lists were issued in January 1948. Wherever possible, gaps in these lists are being filled by the purchase of suitable items by the Division. In this way, the Library has made available one of the world's most complete collections of literature on rubber chemistry and technology.

The journals and books included in these lists may be obtained through inter-library loan. An individual wishing to obtain a book or journal should request it from his local library which will borrow it from the Rubber Library. If the item is not available in the Rubber Library, Miss Clinebell will, in turn, borrow it from one of the cooperating libraries. All requests for inter-library loans, copies of the union lists or answers to questions should be addressed to Miss Clinebell, Rubber Library, University of Akron, Akron, Ohio.

LABOR NOTES

Negotiators for the United Rubber Workers, CIO, and the U. S. Rubber Co. signed a contract on August 3 in New York, N. Y., calling for a 12c hourly wage boost for 34,000 company employees. The new agreement also provides for a union shop and triple time for all work performed on holidays. The settlement covers 19 plants all over the country.

On August 6, the Firestone Tire & Rubber Co. and the United Rubber Workers, CIO, came to an agreement in Cleveland, Ohio, calling for a general 13c an hour increase retroactive to July 30. The raise goes to some 23,000 employees in 8 cities and will bring the over-all average pay to about $2 an hour. The Firestone agreement covered only the wage clause of a contract which expires July 10, 1952.

On July 18, the plant of the Future Rubber Products Co. of Painesville, Ohio, was being picketed by twenty-five women workers. Details of the dispute could not be learned. However, it is understood that District 50 of the United Mine Workers is trying to organize Future Products employees.

The Rome Cable Corp. shut its plant at Rome, N. Y. on July 17 and announced that it was also closing two plants in California until union employees "return to work and work at the regular pace they have maintained in the past." Production workers at the three plants are represented by the United Electrical Workers, independent. The company and the union have been negotiating wages with the union asking for a 15c hourly wage increase and the company offering 7½c. The company stated that various departments in the three plants have been striking off and on, and this brought on the company decision to close the plants.

Rubber Stocks Hit All-Time High

World stocks of natural rubber in the hands of private business and the government is at an all-time high of 1,525,000 long tons, the B. F. Goodrich Co. reported recently. This is almost 300,000 long tons more than was available at the time of Pearl Harbor, the company pointed out. The Goodrich report does not include stocks in Russia, China, or other satellite areas because these figures are not available, it was pointed out. The company reported that the production of natural rubber also is at an all-time high, with output totaling 1,977,500 tons for the 12 months ended April, 1951. The firm estimated that world production for the year ended June 30, 1951, will exceed 2,000,000 tons, surpassing the previous record of 1,850,000 tons set last year. Although production of natural is at a record high, it was pointed out that consumption was declining, primarily because of the use of synthetic rubbers in the United States. Goodrich estimates that actual world consumption of natural rubber this year will be less than 1,550,000 long tons as compared with the record peak of 1,670,000 long tons last year.

Smith Announces Retirement

Herbert E. Smith

Herbert E. Smith, chairman and chief executive officer of the United States Rubber Company, has announced his retirement, effective August 31, after 38 years with the company. He will continue as a director and a member of the finance committee. Mr. Smith started as a salesman in the San Francisco branch in 1913, rose through sales and managerial channels to a vice presidency in 1929, succeeded to the presidency in 1942, and became chairman and chief executive officer in 1949. During his career in the rubber business, Mr. Smith saw the industry grow into one of the most important in the nation. A picture of this growth may be obtained from a comparison of a few figures as of the year 1913 with figures estimated for the year 1951.

Production of pneumatic casings climbed from 6 million to 90 million; rubber consumption increased from 112 million pounds to 2,960 million pounds; rubber consumption per person rose from 1.15 pounds to 19 pounds; value of output of rubber goods jumped from $275 million to $4,620 million; number of employees in rubber manufacturing went from 75,000 to 275,000.

U. S. Rubber shared in the industry's expansion. During the years 1942-1948, when Mr. Smith as president was the chief operating officer, the company's sales steadily increased from $291 million in 1942 to $572 million in 1948. Similarly, net income mounted from $8,381,000 in 1942 to $20,142,000 in 1948. Earnings per common share rose from $1.82 to $8.48. Earned and capital surplus went up from $32 million to $80 million.

Full details on how to form defense production pools are contained in a new booklet issued by the Defense Production Administration. Copies of the booklet, "Pooling Production for Defense," may be obtained from Department of Commerce Field Offices and from the Distribution Section, Printing Services Division, Department of Commerce, Washington 25, D. C.

AMERICAN BILTRITE RUBBER CO. COMBINES AFFILIATED CONCERNS

The many manufacturing and sales activities of the Biltrite Rubber Co. of Chelsea, Mass., the American Tile & Rubber Co. of Trenton, N. J., and the United States and Canadian affiliates are now being conducted under the name of the American Biltrite Rubber Co. Announcement of the name change was made by Miah Marcus, president. Affiliated companies include the Panther-Panco Rubber Co. of Chelsea, and, in Canada, American Tile & Rubber Co., Ltd., and Panther Rubber Co., Ltd., both of Sherbrooke, Quebec. All affiliated companies have long been under the same ownership and management. American Biltrite maintains headquarters in Chelsea, Mass. The company's widely-known trade names "Biltrite" and "Panco" rubber heels and soles, and "Amtico" rubber tile floor covering, will remain unchanged.

The new operating name for the organization consolidates the far-flung rubber manufacturing activities that were started in 1908 by Frank Bernstein and Miah Marcus in Trenton in a plant devoted to the manufacture of rubber heels and soles for the shoe repair trade. In 1910 a second plant was opened. Located in Stoughton, Mass., it was incorporated as the Panther Rubber Manufacturing Co. Later, the Panther Rubber Co., Ltd., was formed in Sherbrooke, Quebec, and a plant opened there for the Canadian trade.

In 1917, when production required larger facilities, a new plant was acquired in Chelsea, Mass., and was operated as the Panco Rubber Co. Originally all rubber heel and sole production was sold exclusively to the shoe repair trade through findings jobbers. Later the company expanded to supply manufacturers of new shoes.

The Panther Rubber Manufacturing Co. and the Panco Rubber Co. through pioneering research developed the first composition soles. These were introduced under the now famous "Panco" trade name shortly after the opening of the Chelsea factory and were sold both to the shoe repair trade and new shoe manufacturers.

The American Tile and Rubber Co. was organized in 1920 and a plant was established in Trenton for the manufacture of rubber flooring under the trade name of "Amtico." The American and Canadian companies now occupy greatly expanded plants in Trenton, and in Sherbrooke, Quebec. "Amtico" is now the largest and oldest producer of rubber flooring in the industry. In 1932 the Stoughton and Chelsea plants merged their manufacturing and sales organizations to form the Panther-Panco Rubber Company.

The officers and directors of the American Biltrite Rubber Co. interests are: Miah Marcus, president and director; Maurice J. Bernstein, treasurer and director; Richard J. Marcus, secretary and director. The other officers and directors are David W. Bernstein, Eliott L. Bernstein, and Robert G. Marcus.

The executive heads for the various divisions and departments of the company are: Heel & Sole Division—Maurice J. Bernstein, general sales manager; David W. Bernstein, production manager. Shoe Factory Sales—Eliott L. Bernstein, sales manager. Shoe Findings Department — David Prupas, sales manager. Rubber Flooring Division—Robert G. Marcus, general manager and sales manager.

For the Canadian Plant Richard J. Marcus is in charge of operation, assisted by Evan Joslin, general manager; Harry Prupas, general sales manager, and Charles Mee, sales manager, Rubber Flooring Division.

Report Substitute for Carnauba

Concord Chemical Co., Moorestown, N. J., has reported the development of a wax substitute for carnauba wax. Introduced as Concord Wax No. 407, the new material has a melting point of 86° C., about 5° higher than imported refined carnauba. Resultant emulsions are said to be translucent, light in color, highly stable with good gloss and durability. The wax emulsions may be used for any purpose for which carnauba or candelilla emulsion is suitable.

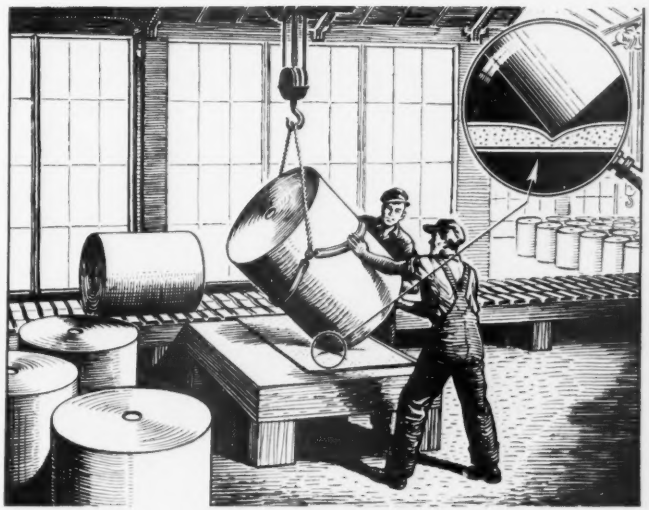
Dimethoxy Tetraethylene Glycol

Dimethoxy tetraethylene glycol, a selective solvent with the unique property of miscibility with both water and organic compounds is once again available from the Ansul Chemical Co., Marinette, Wisc., the current manufacturer. Ansul Chemical reports that the solvent power of this high boiling ether (275° C.) may be changed by dilution with water or hydrocarbons. In addition, the chemical contains no active hydrogen atom and may therefore be efficiently used as a reaction medium for Grignard and sodium condensation reactions.

Anchor Adhesives Corp. Formed

Anchor Adhesives Corp., has been formed at 36-23 164th St., Flushing, New York, for the manufacture of latex and solvent adhesives. Irving Bederson and Steve Proops have severed their relationship with the Industrial Latex Co. to form the new company. Mr. Proops is president of Anchor Adhesives and Mr. Bederson is vice-president. The plant is equipped with modern facilities and is now in production.

UNIQUE LANDING MAT DEVELOPED BY THE GOODYEAR TIRE & RUBBER CO.



Operators responsible for transferring fragile articles from place to place are assured of happy landings when they use a unique landing mat produced by The Goodyear Tire & Rubber Company. Developed by Goodyear's Canadian subsidiary at New Toronto, Ont., the landing mat, made of rubber and Airfoam, is already saving millions of dollars in the paper industry and seems to have unlimited applications in the materials handling field. Originally designed for paper manufacturers, the landing mat has cut destructive handling losses from 30 percent to practically zero. The jolt of unloading big rolls of newsprint paper is cushioned and damage to the ends of the rolls prevented by the Goodyear mat.

The mat is built up with a 2½ inch center of firm Airfoam and a top and bottom cover of high quality lively rubber about ¼ inch thick. The Airfoam absorbs the shock and the cover ties the mats together. The landing mat can be of service wherever heavy articles are subject to damage when being handled. Loading and unloading operations of drums, barrels, crates and packing cases labelled "with care" are facilitated by this new application of Airfoam.

NAMES IN THE NEWS

J. J. Lawlor, formerly manager of the St. Louis, Mo., district office of the Shell Chemical Corp., has been appointed manger of the Chicago, Ill., district office.

George F. Long, previously associated with Swift & Co., has been appointed to the textile sales engineering staff of the W. C. Hardesty Co., Inc., for the sale of fatty acids.

Eldrid A. Kunze, associated with the B. F. Goodrich Co. for the past 16 years, has been named manager of the retail service supervision department of the Replacement Tire Sales Division.

Herbert G. Pratt, associated with the American Cyanamid Co. since 1948, has been named manager of the San Francisco, Calif., office of the company's Industrial Chemicals Division.

Edgar T. Gregory, formerly operating manager of the Industrial Products Sales Department of the B. F. Goodrich Co., has been named manager of flat belting sales. Donald E. Schlemmer, associated with the company for the past 15 years, has been named to succeed Mr. Gregory.

Sheldon T. Dahl, associated with the American Cyanamid Co. since 1948, has been named West Coast manager of the company's Industrial Chemicals Division and Plastics and Resins Divisions.

Robert Price, formerly manager of the Development Department of the B. F. Goodrich Co., has been appointed sales manager of the Plastics Products Division with headquarters in Marietta, Ohio.

Brownie Carslake, manager of field personnel of the Firestone Tire & Rubber Co. on the West Coast, has been awarded a service pin by the company marking his completion of 35 years with the company.

Albert M. Kahn, president of the Hamilton Rubber Co. and the Acme Rubber Corp., both located in Trenton, N. J., has been named president of Spear & Co., home furnishing retail chain.

A. H. Borchardt, formerly assistant vice-president and manager of the centrifugal pump application and sales division of the Worthington Pump and Machinery Corp., Harrison, N. J., has been elected vice-president in charge of sales for the company's entire line of pumping equipment.

Paul E. Finical, a June graduate of Ohio Wesleyan University, has joined the Advertising Department of the Pennsylvania Rubber Co., Mansfield, Ohio, where he will work on sales promotion.

Frank R. Plum, formerly director of sales of the Bakery Division of American Machine & Foundry Co., New York, N. Y., has been named vice-president and general manager of the division which produces, among other things, mixers for the rubber industry.

Benson M. Austin has been named product manager of the Industrial and Commercial Department of the Industrial Tape Corp., New Brunswick, N. J.

Clinton B. Burnett, vice-president of the Johns-Manville Products Corp., a subsidiary of the Johns-Manville Corp., has been named engineering director of the parent organization.

Max A. Minnig, vice-president in charge of the Carbon Black Division of the Witco Chemical Co., has been elected to the board of directors of the company.

P. E. H. Leroy, vice-president in charge of finance of the Goodyear Tire & Rubber Co., was recently decorated with the Cross with Crown in the Order of Adolphe of Nassau by Her Royal Highness, the Grand Duchess of Luxembourg, during a private audience at the Grand Ducal Palace in Luxembourg on July 9.

Ralph C. Edgar, formerly personnel director of the Allegheny Ludlum Steel Corp., has been named director of industrial, personnel and public relations for Ball Brothers Co., Inc., Muncie, Ind.

Max F. Moyer, manager of the Cycle Tire Sales Department of the Goodyear Tire & Rubber Co. at Akron, Ohio, was recently presented with a 25-year service pin by the company.

Robert Frank Nairn, formerly chairman of the New Products Committee of Congoleum-Nairn, Inc., has been named general manager of the company's Delaware Floor Products Division with headquarters at Wilmington, Del.

Bruce R. Silver, technical service manager of the New Jersey Zinc Sales Co., was recently elected president of the Arts and Engineering Alumni Association of New York University.

Albert A. Hally, associated with the Industrial Tape Corp. since 1948, has been named sales manager of the Industrial and Commercial Department of the company.

Dr. Robert A. Winters, executive director of the Rubber Heel & Sole Institute, New York, N. Y., and general manager of the Elastic Colloid Research Corp. of Avon, Mass., served as judge of the Eastern Championships of the American Water Ski Association held at Penn Yan, N. Y., on July 20 to 22.

Thomas C. Roberts, formerly executive assistant on the staff of the Association of Better Business Bureaus, New York, N. Y., has been named director of public relations for the association.

Robert D. Turner, formerly assistant to the treasurer of the Pesco Products Division of the Borg-Warner Corp., Bedford, Ohio, has been appointed secretary-treasurer of the Marvel-Schebler Products Division of the corporation with headquarters at Decatur, Ill.

H. L. Henry, formerly a sales representative for the Watson-Stillman Co. in Western New York State, has been named divisional sales representative for the company in Northern Ohio.

Captain Ellsworth E. Roth, USN, Ret., has been named assistant to the works manager of the Defense Division, Ingersoll Products Division of the Borg-Warner Corp., Kalamazoo, Mich.

Harry L. Powell, previously manufacturers' sales representative in the Milwaukee, Wisc., area for the Goodyear Tire & Rubber Co., has been named manager of the company's Manufacturers' Sales Department in Milwaukee.

Arthur C. Horrocks, honorary life member of the Northwest Pacific and Intermountain Farm Implement Associations, will be principal speaker for seven of the nine state-wide luncheons scheduled during August and September to honor soil-conservation minded farmers nominated for awards in the Goodyear Tire & Rubber Company's annual Soil Conservation Awards program. Mr. Horrocks is a former director of the Goodyear Industrial University.

Harold W. Paine, formerly assistant to the director of the Polychemicals Department laboratory, E. I. du Pont de Nemours & Co., Inc., retired on July 31 after devoting 36 years to plastics research.

William R. Berkinshaw, formerly field representative of the Films and Flooring Division, Goodyear Tire & Rubber Co. at Detroit, Mich., has been transferred in a similar capacity to the Los Angeles, Calif., district offices.

Charles W. Bowden, Jr., has been named chemical industry manager for the Brown Instruments Division of the Minneapolis-Honeywell Regulator Co.

Howard A. Bellows, formerly eastern division sales manager of the General Tire & Rubber Co., has been transferred to the company's main offices in Akron, Ohio, as manager of retail merchandising succeeding S. S. Poor who is assuming new duties.

A. L. Hollis, technical manager of the Akron chemical plant of the B. F. Goodrich Chemical Co., has been granted a leave of absence by the company to serve as a consultant in the research and development division of the Office of Rubber Reserve at Washington, D. C.

Named DuPont RCD Sales Executive

Pierre S. du Pont, III

Pierre S. du Pont, 3rd, has been named assistant director of sales of the Rubber Chemicals Division, Organic Chemicals Department of E. I. du Pont de Nemours & Co., Inc. Mr. du Pont, a member of the board of directors of the company, had been manager of rayon tire yarn sales since 1947. Graduating from Massachusetts Institute of Technology in 1933 with a bachelor of science degree, he joined the company a year later as a chemist at the Experimental Station in Wilmington, Del. In 1935, he was transferred to the Industrial Engineering Division, and in 1938, became group head of industrial engineering at three Rayon Department plants, with headquarters at Richmond, Va. Soon afterward, Mr. du Pont returned to the Industrial Engineering Division in Wilmington, taking charge of mechanical development work for all departments of the company. In July, 1939, he was transferred to the Development Department as a technical investigator. One year later, he took charge of industrial sales and development work in the Nylon Division of the Rayon Department. Upon the outbreak of World War II, Mr. du Pont assumed direction of all military product developments in the Nylon Division. He was appointed assistant director of the Trade Analysis Division in September, 1945, and was made manager of rayon tire yarn sales in November, 1947.

Heyden To Expand Laboratories

Heyden Chemical Corp., New York, N. Y., has completed plans for construction of a series of new laboratory units at its Chemical Research Division, Garfield, N. J., which will increase research facilities by 30%. The first new laboratory unit, now under construction, is scheduled for completion in the last quarter of 1951. A major factor in the research expansion planned is a broad program to develop new applications of Pentek and other pentaerythritol derivatives which are used as the base for the new quick drying, weather resistant paints, varnishes, resins and lacquers. Pentaerythritol is a solid alcohol made from formaldehyde whose principal use in World War II was as a base for explosives.

VINYL SPECIALTIES

Washburn Co., Worcester 8, Mass., is producing a new line of coat and hat hooks which have been covered by a colorful protective coating of Vinylite resin.

Permanent wire and cable markers are being made of Vinylite plastic rigid sheet in either flat or sleeve type by Actioncraft Products, Port Washington, N. Y. The markers are made with an overlay of Vinylite plastic to protect the lettering.

Bentley, Harris Manufacturing Co., Conshohocken, Penna., is producing electrical insulating tubing and sleeving made of Vinylite resin plastisol and glass fibers. The product is said to provide sturdier insulation at the same price as cotton or rayon-base insulations.

A "Bonny Braids" doll, named for the newly-born daughter of comic strip character Dick Tracy, has made its appearance on the market with life-like skin made of Vinlyite resins. The doll is manufactured by Ideal Toy Corp., New York, N. Y.

Goodrich Aircraft Refueling Aid

The U. S. Air Force's new flying filling station, the Boeing KC-97, depends on a rubber device called a "surge boot" which performs an important function in successful in-flight refueling by "cushioning" against high pressures caused by a sudden shut-off in the fuel line. Developed by engineers of the B. F. Goodrich Co. and the Boeing Airplane Co., the surge boot weighs only 15 pounds. The unusual construction of the boot provides the "cushion" to absorb the high surge pressure of the fuel in the line when the flow is suddenly shut off at the nozzle.

French Plan Rubber Production

A working plan for making synthetic rubber from alcohol has been set up under the name, Societe d'Etudes du Caoutchouc Synthetique a Base d'Alcool, on the initiative of the French Alcohol Institute and the General Confederation of Sugar Beet Growers. The new firm will seek administrative, economic, financial, technical and commercial assistance in establishing synthetic rubber factories and the use of their by-products. Under present plans, the firm could reach an output of 35,000 to 40,000 tons of synthetic rubber yearly.

Establishing European Branch

Battelle Memorial Institute, said to be the world's largest independent industrial research foundation, will establish a European branch of its laboratories to serve the European economy. The decision follows a recently completed survey of scientific and industrial conditions in Europe. The exact location of the European branch and other details will depend upon the outcome of negotiations now in progress. It is expected, however, that the new service will be in operation early next year.

Named Director of Development

Edgar S. Thompson

Edgar S. Thompson has been appointed director of development for the new Coated Products Division of the Interchemical Corp., New York, N. Y. Mr. Thompson will coordinate the chemical, engineering and research efforts of the division in the development of all new products. Mr. Thompson has been associated with Interchemical for the past three years, handling assignments associated with product development. From 1946 to 1948 he was manager of the Rubber and Plastics Machinery Division of the Farrel-Birmingham Co. Prior to that time he served for six years with the Armstrong Cork Co. From 1936 to 1940, following his graduation from the University of New Hampshire, Mr. Thompson was employed by the General Chemical Co., division of the Allied Chemical & Dye Corp. In his new capacity with Interchemical, Mr. Thompson is a member of the Defense Contract & Development Committee of the Coated Products Division.

Link Named Bellows President

Herbert B. Link, formerly executive vice-president of the Bellows Co., Akron, Ohio, has been named president of the company succeeding the late L. F. R. Bellows. L. F. R. Bellows, Jr., Detroit, Mich., was named vice-president of the company, and Byron D. Kuth of Cleveland, Ohio, was named secretary-treasurer. The same officers were likewise named for the Bellows Electric Sign Corp., and Bellows Products, Inc., affiliated companies. In other appointments, W. C. Richards, Jr., associated with the Bellows Co. since 1947, was named executive assistant to the president. Bellows manufactures pneumatic equipment and accessories for the rubber and other industries.

DPA Approves Berea Rubber Loan

The Defense Production Administration has approved an emergency loan of $575,000 to the Berea Rubber Co., Cleveland, Ohio, for the construction of a plant and the purchase of machinery and equipment. Berea produces synthetic rubber O-rings for aircraft.

FINANCIAL NEWS

U. S. Rubber Co.

First Half: Net income of $16,427,189, which is equal to $7.85 per common share, compared with $8,848,757, or $3.55 a share in the first six months of 1950. Net sales in the first half of 1950 amounted to $427,714,511, against $291,278,706 in the first six months of the preceding year. Earnings and sales in the first half of 1951 reached new all-time highs for the company. As of June 30, 1951, the company reported current assets of $337,962,691, and current liabilities of $162,441,231. As of June 30, 1950, current assets were $246,072,906, while current liabilities were $73,061,848.

Seiberling Rubber Co.

First Half: Net income of $675,427, which is equal to $1.86 a common share, compared with $581,908, or $1.53 a common share in the first half of the preceding year. Net sales in the first half of 1951 amounted to $22,123,570, against $15,130,847 in the six months ended June 30, 1950. According to the report, the company is attempting to diversify its production, and is studying a plan to add new lines of manufacture in rubber or closely related products.

Hewitt-Robins, Inc.

First Half: Net profit of $633,844, which is equal to $2.27 a common share, compared with $423,130, or $1.52 a share, in the first half of 1950. Sales in the first half of 1951 amounted to $18,066,679, against $9,723,324 in the first six months of the preceding year. Sales for the first half of 1951 approach the total sales figure for the entire year of 1950, which amounted to $23,451,792.

St. Joseph Lead Co.

First Half: Net income of $7,729,138, which is equal to $3.13 a share, compared with $4,121,164, or $1.67 a share, in the first half of the previous year. Net sales in the first six months of 1951 totaled $58,399,749, against $44,848,764 in the first six months of 1950.

Brunswick-Balke-Collender Co.

First Half: Net profit of $8,182, which is equal to 32c a preferred share on net sales of $9,984,204, compared with $347,450, or 63c a common share on sales of $10,408,979 for the six months ended June 30, 1950.

Circle Wire & Cable Corp.

First Half: Net profit of $1,182,059, which is equal to $1.57 a share. No comparison with the previous years' earnings is available.

Boston Woven Hose & Rubber Co.

Nine Months to May 31: Net income of $973,629, which is equal to $10.88 per common share, compared with $216,801, or $2.02 a share, in the corresponding period of the previous fiscal year. Sales in the first nine months of the 1951 fiscal year amounted to $19,400,479, against $10,317,956 in the first nine months of the 1950 fiscal year.

Phillips Petroleum Co.

First Half: Net profit of $32,002,597, which is equal to $2.46 each on 12,997,000 capital shares, contrasted with $22,039,857, or $1.82 each on 6,051,121 capital shares in the six months ended June 30, 1950. The 1950 figures have been adjusted to reflect a 2-for-1 stock split on June 19, 1951, based on average shares outstanding during the period.

Allen Industries, Inc.

First Half: Net income of $600,022, which is equal to $1.07 each on 559,200 common shares, against $629,313, or $1.12 a share in the first half of the preceding year. Sales during the first half of 1951 rose to a new high of $19,028,551, 21.85% higher than the $15,616,053 recorded in the first half of the preceding year.

Plymouth Rubber Co.

Six Months to May 31: Net income of $531,009, which is equal to 59c each on the 900,000 common capital shares outstanding, compared with $209,198, or 23c a common share in the corresponding period of the preceding fiscal year. On May 31, 1951, current assets were $6,184,345 and current liabilities were $2,539,255.

Blaw-Knox Co.

First Half: Net profit of $1,510,406, which is equal to $1.07 a share, compared with $1,301,530, or 92c a share in the first six months of 1950. Shipments and billings in the first six months of 1951 totaled $47,071,747, against $20,450,933 in the first six months of the previous year.

Industrial Rayon Corp.

First Half: Net income of $4,717,599, which is equal to $2.68 per share of common stock, compared with $3.34 per share for the first half of 1950 after adjustment for additional federal taxes on income provided by the 1950 Revenue Acts.

Okonite Company

First Half: Net profit of $745,116, which is equal to $5.24 a share, contrasted with $306,522, or $2.15 a share, in the first six months of the preceding year.

National Lead Co.

First Half: Net income of $12,961,777, which is equal to $3.51 each on 3,386,125 common shares, compared with $12,578,051, or $3.43 each on 3,360,325 common shares in the first half of the preceding year. Net sales in the first six months of 1951 amounted to $204,891,292, against $138,446,358 in the six months ended June 30, 1950.

Dewey & Almy Chemical Co.

First Half: Net profit of $901,746, which is equal to 99c a common share, compared with $679,770, or 74c a share in the first six months of the preceding year. Sales in the first six months of 1951 increased to $15,069,357 from the $9,003,491 recorded in the six months ended June 30, 1950.

Crown Cork & Seal Co.

First Half: Net income of $2,191,404, which is equal to $1.59 each on 1,207,700 common shares, contrasted with $717,352, or 37c each on an equal number of shares in the six months ended June 30, 1950. Net sales in the first six months of 1951 amounted to $53,051,026, against $38,195,422 in the first half of the preceding year.

Baldwin-Lima-Hamilton Corp.

First Half: Net income of $2,007,313, which is equal to 42c each on 4,781,958 common shares, compared with $1,552,645, or 62c each on 2,375,208 shares a year earlier. Sales in the first half of 1951 increased to $98,129,060 from $45,930,859 set in the first half of the preceding year.

Rome Cable Corp.

Quarter Ended June 30: Net profit of $489,043, which is equal to $1.05 each on 458,260 common shares, compared with $260,256, or 60c each on 403,075 common shares in the quarter ended June 20, 1950.

National Automotive Fibres, Inc.

First Half: Net profit of $2,747,963, which is equal to $2.76 a share on net sales of $50,189,258, compared with $1,566,116, or $1.57 a share, on net sales of $28,991,920 in the first half of the preceding year.

General Tire & Rubber Co.

Six Months Ended May 31: Net Profit of $3,411,779, which is equal to $5.48 a common share, compared with $1,666,974, or $2.44 a share, in the same six-month period of 1950.

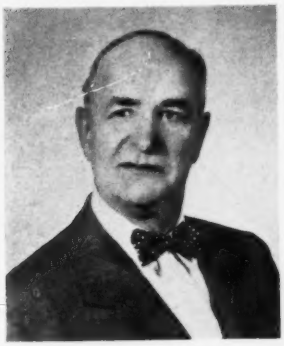
O'Sullivan Rubber Corp.

First Half: Net income of $147,057, which is equal to 33c a common share, compared with $59,479, or 11c a share for the six months ended June 30, 1950.

DeVilbiss Co.

First Half: Net profit of $486,371, which is equal to $1.62 a share, compared with $267,111 or 89c a share in the first half of the preceding year.

Joins Whittaker, Clark & Daniels



William F. Erath

William F. Erath has joined the technical and sales staff of Whittaker, Clark & Daniels, Inc., New York, N. Y. Mr. Erath, a recognized authority on dry colors, came to the United States in 1912, when his employers, G. Siegle Co. of Germany, sent him to their branch plant in Staten Island, N. Y. He later operated a color laboratory and supervised sales work for Siegle in Chicago, Ill. Following graduate research work in organic chemistry at Brooklyn Polytechnic Institute, Mr. Erath directed his attention toward the production of harmless cosmetic colors. His efforts were rewarded when, in 1939, a Federal law was promulgated and supervised by the Food, Drug & Cosmetic Administration for the purification and certification of cosmetic colors. This transition period in the cosmetic industry enhanced Mr. Erath's value to the dry color industry.

Wm. R. Thropp Changes Operations

Wm. R. Thropp & Sons Corp., Trenton, N. J., has changed its method of operations. Under the new arrangement, Wm. R. Thropp & Sons Corp. will design, engineer and produce special machinery or parts to specifications. It will also produce modernized rubber mill machinery up to 100,000 pound weights from foundry to the finished product. The Thropp Electrical Sales Corp., also of Trenton, is the authorized agent and distributor for industrial power apparatus manufactured by the General Electric Co. In this capacity, the firm is qualified to give engineering service in the application of motors, controls, switchgear, transformers, drives and power distribution equipment. G-E motors, controls and renewal parts are carried in stock by Thropp Electric Sales.

Twenty-six patents owned by the Atomic Energy Commission and made available to industry under a royalty-free license are featured in the July, 1951 issue of the *Bibliography of Technical Reports* released by the Office of Technical Services of the U. S. Department of Commerce. Copies are available at 50c each.

More Certificates of Necessity

The Defense Production Administration has issued a number of additional Certificates of Necessity providing for accelerated tax amortization on new defense facilities. Certificates issued recently include:

Andrews-Alderfer Processing Co., Akron, Ohio, $161,796 for life saving equipment.

Raybestos-Manhattan, Inc., Passaic, N.J., $65,000 for hose.

Sid Richardson Carbon Co., Fort Worth, Texas, $2,000,661 for carbon black for the synthetic rubber program.

General Cable Corp., Bayonne, N. J., $2,550 for electrical cable.

Lake Erie Engineering Corp., Tonawanda, N. Y., $29,300 for heavy hydraulic presses.

Eagle-Picher Co., Galena, Kansas, $288,500 for zinc oxide.

Gates Rubber Co., Denver, Colo., $174,770 for wire braided hose.

Firestone Tire & Rubber Co., Los Angeles, Calif., $1,399,550 for fuel cells.

E. I. du Pont de Nemours & Co., Inc., Louisville, Ky., $7,015,000 for neoprene.

E. I. du Pont de Nemours & Co., Inc., Louisville, Ky., $401,000 for neoprene.

Farrel-Birmingham Co., Derby, Conn., $1,666,000 for rubber machinery.

Brown Co., Berlin, N. H., $450,000 for Solka-Floc.

Midwest Rubber Reclaiming Co., Los Angeles, Calif., $1,547,000 for reclaimed rubber.

Kirkhill Rubber Co., Brea, Calif., $182,889 for mixing rubber and rubber compounds.

Agilene Fabricated Containers

The Plastics Division of the American Agile Corp., 5806 Hough Ave., Cleveland 3, Ohio, is producing a new line of "Agilene" bottles, jars and safety jugs fabricated from polyethylene. "Agilene" bottles are fabricated from molded and cast sections and are welded by the hot gas welding method for thermoplastic materials. The bottles, jars and safety jugs are of rigid construction, and their light weight and resistance to impact and corrosive chemicals makes them ideal for use in a large number of diversified industries. The bottles are provided with a tight-closing screw cap, while the storage jars are provided with a removable lid. "Agilene" jugs are fitted with a bail-type handle and a top cover. All units are available in various capacities.

Heads Aldan Technical Service

George E. Martin, formerly technologist in charge of coated fabrics development for the research laboratories of the U. S. Army Quartermaster Corps, has been named head of the Technical Service Division of the Aldan Rubber Co., Philadelphia, Penna. A graduate of the Philadelphia Textile Institute, Mr. Martin is a member of the American Chemical Society and the American Association of Textile Chemists and Colorists. He is also on the Coated Fabrics Committee of the American Society for Testing Materials.

Goecke Named Sales Engineer

George H. Goecke

George H. Goecke, formerly associated with the Warren Steam Pump Co. of Warren, Mass., has been named sales engineer for Industrial Ovens, Inc., Cleveland, Ohio. A graduate in mechanical engineering from Cornell University, Mr. Goecke was for 15 years a sales engineer for the Ingersoll-Rand Co. For the past year, he has been a manufacturer's representative in northern Ohio and western Pennsylvania for the Warren Steam Pump Co. A native of Elyria, Ohio, Mr. Goecke served in the U. S. Navy during World War II. In his new capacity, he will maintain headquarters in Cleveland, Ohio.

Wallhide Rubberized Satin Finish

Pittsburgh Plate Glass Co., Pittsburgh, Penna., has introduced a new interior paint that has unusual decorative possibilities combined with the durability and washability of enamel. The new product, known as "Wallhide Rubberized Satin Finish," has rubberlike characteristics with a distinctive sheen low enough to make it suitable for use in any room of the home. The paint acts as its own primer and may be applied by brush, spray or roller. The finish dries in one hour to a smooth and velvet-like sheen. The rubberized film does not shine up when washed in local areas, and it does not chip or crack. After drying several weeks, the painted surface may be scrubbed without damage to the sheen or color.

Koroseal Electrical Tape

A new electrical tape, made with Koroseal material, and said by the manufacturer to have many advantages over ordinary electrical tapes, has been announced by the B. F. Goodrich Co. The adhesive is non-transferring, and can be pressed onto a dry surface innumerable times without losing its stickiness. It will not transfer the adhesive from the face, lose its tackiness, or ability to adhere, sticks snugly and securely to itself and insulation around copper wire. The tape has a dielectric strength of 8000 volts, is waterproof, highly abrasion resistant and flameproof, resistant to acids, oil alkalies and corrosive salts. The tape is packaged in a roll 60 feet long and is ¾ inches wide and .007 inches thick.

CANADIAN NEWS

Ira G. Needles, formerly vice-president of the B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., has been elected president of the company succeeding George W. Sawin, who resigned on June 30 for reasons of health. Mr. Needles joined Goodrich in 1916 and in 1925 became a member of the Canadian subsidiary. He was assistant sales manager of the Tire Division until 1930 when he was made general tire sales manager. He was elected vice-president in charge of sales in 1945.

Mr. Sawin had been president of the company since 1941, and associated with Goodrich since 1913. He joined the company following his graduation from the University of Delaware. Mr. Sawin first served as a tire salesman in Philadelphia, became assistant manager in Buffalo in 1913, manager of tire sales in Chicago in 1919 and Chicago branch manager in 1920. In 1924, Mr. Sawin became New York City district manager, and returned to Chicago in 1926 as branch manager. Later that year he was named tire sales manager with headquarters in Akron. In 1929 he became eastern district manager and in 1931 Philadelphia district manager. Mr. Sawin was elected vice-president and general manager of the B. F. Goodrich Rubber Co. of Canada, Ltd., in 1936 and five years later became president.

General Tire & Rubber Co. of Canada, Ltd., has purchased the Joseph Stokes Rubber Co., Ltd., Welland, Ont. The sales price was not revealed. Stokes will continue operations as a General Tire of Canada subsidiary.

Donald R. Caskie, formerly associated with the treasurer's office of the Firestone Tire & Rubber Co., of Canada, Ltd., has been appointed assistant treasurer of the company.

Ira G. Needles

newly-elected president of the B. F. Goodrich Rubber Co. of Canada

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Some 2,100 plant and office employees of the Goodyear Tire & Rubber Co. plant at New Toronto, Ont., Canada, recently voted to stay on strike until the company offers higher wages and joint negotiation procedure. Some 700 employees of the Goodyear plant at Bowmanville, Ont., also walked off the job and voted to stay out.

The union is seeking a 25c hourly wage increase and joint negotiation for the two plant locals in New Toronto and the plant local in Bowmanville. The company has offered 8.7c an hour and joint negotiation with the two plant locals, excluding the office workers local.

Firestone Plans Stock Split

Plans for splitting the common stock of the Firestone Tire & Rubber Co. on a two-for-one basis were recently announced. The board of directors has adopted resolutions recommending to its holders of common stock that the company's articles of incorporation be amended. The principle revision provides that the authorized number of shares of common stock be changed from 3,500,000 with a par value of $25 per share to 7,000,000 having a par value of $7.50 per share. The proposal will be submitted to a meeting of common stockholders on September 8, the company stated.

Grand Prairie Moves Offices

Grand Prairie Rubber Co. has moved its executive offices to its plant at Arlington, Texas. The firm's offices were formerly located at 221 West Main St. in Grand Prairie.

Goodrich Expanding Miami Plant

Another major expansion of the Miami, Okla., tire and tube plant of the B. F. Goodrich Co., the third since 1946, has recently been announced. Construction work, which will add 110,000 square feet of floor space, will be undertaken as rapidly as building materials are available, company officials said. The expansion will add 60,000 square feet of manufacturing space, the balance of the new addition being designed for storage and handling of raw materials and finished goods. Enlarged power house facilities are nearing completion and the plant, with the latest addition, will have nearly a million square feet of floor space and will produce approximately 500,000 pounds of finished goods daily.

Raw Materials Moves Offices

Raw Materials Co. has moved its office in Boston, Mass., to a new address. The firm is now located at 140 Federal St., Boston 10.

Installs Beta Ray Gauge

General Tire & Rubber Co., Akron, Ohio, has installed a Beta Ray Gauge to measure rubberized fabric as it flows from a calender. The unit is said to represent the first practical application of radioactive measurement in the history of tires. Utilizing two grains of Strontium 90, a by-product of the atomic pile at Oak Ridge, Tenn., as a source of radioactivity, the revolutionary device makes possible exact and continuous measurement of materials used in tire manufacturing. Developed after 18 months of research by the Industrial Nucleonics Corp. of Columbus, Ohio, the Beta Gauge is basically simple. The material being gauged, tire fabric, passes between a small, stainless steel capsule containing a tiny amount of Strontium 90 and a radiation detector, known as an ionization chamber. The more lightweight the fabric, the greater amount of radiation that passes through. Variations in the amount of radioactivity passing through the material are noted and recorded by an adjoining device. By interpreting this continuous record, calender machine operators are able to eliminate "thick" and "thin" spots in the fabric material, two chief causes of tire failures.

G-E Productive Maintenance Plan

A new plan to help industry get the most productivity from its existing facilities has been announced by the General Electric Co., Schenectady, N. Y. Called "Productive Maintenance," the plan is designed primarily to assist maintenance engineers in setting-up a program to minimize lost production time and forced idleness due to equipment failures. The plan recommends (1) an adequate staff of trained maintenance men, armed with (2) the tools needed to perform properly the functions of (3) regular, routine checks of operating equipment, and (4) planned outage of this equipment at regular, scheduled intervals. Rebuilding and modernizing machines during time of planned outage is done readily with (5) an adequate stock of mechanical and electrical renewal parts. To help the maintenance engineer materially, G-E is offering a "Productive Maintenance Kit," a file-size package of maintenance ideas to guide him in setting up a working program.

University Buys Wilson Plants

Vanderbilt University, Nashville, Tenn., has purchased two plants from the Wilson Athletic Goods Manufacturing Co. at Tullahoma, Tenn. The purchase price was $300,000. The transaction followed Vanderbilt's $2,700,000 purchase of the Charlotte, N. C., mill of Textron, Inc., on June 29. As in the Textron purchase, the property was leased back to the present management. One of the two Wilson plants sold to Vanderbilt University is used for the manufacture of baseball equipment while the other is used for the manufacture of golf equipment. The baseball plant has 38,500 square feet of floor space and the golf plant, 32,000 square feet. Wilson received a 25-year lease on the facilities. University officials said the purpose of the Wilson and Textron transactions was to "accrue tax-free income to Vanderbilt."

Expands Silica Pigment Output

A major expansion of production facilities is underway at the Barberton, Ohio plant operated by Southern Alkali Corporation, a wholly-owned subsidiary of Pittsburgh Plate Glass Company. Approximately $11,000,000 will be spent in expanding Hi-Sil and Silene silica pigment production, according to Harry B. Higgins, president of Pittsburgh Plate. Under development in the firm's chemical laboratories since 1937, Silene found wide acceptance from the rubber industry during World War II as reinforcing pigment in non-black rubber products. Hi-Sil, a related silica pigment, essential in the production of non-black rubber products with high tear resistance, has been marketed on a limited basis since 1949.

"Designed for specific uses in the defense program, these are the only silica pigments now being commercially produced and available at reasonable prices," Mr. Higgins stated. As an example, both pigments are used in the production of non-black soling for military boots used in combat in snow covered areas. White soles with adequate properties of abrasion and cold resistance are necessary to completely camouflage the boot of a soldier operating in snow. Hi-Sil permits manufacture in the color desired for camouflage purposes of a number of non-black synthetic rubber items and at the same time gives these materials high tear strengths. Pontoons and other flotation gear whether made from butyl or synthetic rubber have the best properties when Hi-Sil is used as the pigment in place of any other non-black material.

Cites Growth of Rubber Piping

The current issue of "Rubber Developments," a quarterly available from the Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D. C., contains an article describing the use of rubber piping in many fields. The issue also contains an article on the use of resin-rubber soles and heels in footwear. Another interesting article recounts tests which are taking place in substituting rubber tired, non-rail cars for conventional steel wheels and rails in the subway system of Paris, France. Still another article is devoted to an accounting of the use of latex ribbed skeletons in medical schools.

Firestone Tire & Rubber Co.

First Half: Net profit of $23,082,048, which is equal to $11.69 a share of common stock, compared with $13,320,055, or $6.68 a common share in the first half of the previous year. The 1951 profit figure represented a new all-time high and was achieved after providing $6,450,000 for earnings of foreign subsidiaries which cannot be remitted to the United States.

Brown Rubber Co.

First Half: Net income of $652,134, which is equal to $1.73 per share, compared with $594,085, or $1.58 a common share in the first six months of the preceding year.

Doughboy Plastic Play Houses

Doughboy Industries, New Richmond, Wisc., has introduced a line of playhouses made of Vinylite plastic. The largest of the units, the "Playhouse," is 8 feet long, 4 feet wide and 5½ feet high, with gabled roof affording full head room. The "Play-

house," as illustrated, is easily suspended from any type of line drawn between posts or trees. The unit is packed with a knock down wooden frame which may be easily assembled. The "Big Ranch House" fits over two standard size card tables and is 60 inches long, 30 inches wide and 28 inches high. The "Little Ranch House" fits over one standard size card table. This unit is 30 inches long, 30 inches wide and 28 inches high. Both the Big and Little Ranch Houses come with gabled roof and all three units are colorfully decorated.

New Goodrich Chemical Plant

B. F. Goodrich Chemical Co., Cleveland, Ohio, a division of the B. F. Goodrich Co., Akron, Ohio, is planning to construct a new plant at Calvert City, Ky., for the production of vinyl chloride monomer. The new plant, to be located on a tract comprising about 175 acres, will on completion represent an investment of more than $5,000,000. The plant will be located on a part of the 1,000-acre tract recently purchased by the National Carbide Co., a division of the Air Reduction Co. The Goodrich Chemical plant will use National Carbide products in its operations. It will employ about 100 persons when in full operation. Three buildings to house manufacturing operations, service and maintenance facilities, power plant and offices will be under way shortly, after final Defense Production authority to construct the plant is granted. The new plant is expected to be in operation in late 1952 or early 1953. First shipments of vinyl chloride monomer will go to the Goodrich Chemical plant at Avon Lake, Ohio, and to supplement supplies made at Louisville, Ky.

Heresite Promotes Personnel

Heresite & Chemical Co., Manitowoc, Wisconsin, manufacturers of synthetic rubbers and resins, has announced several promotions and changes in its executive personnel. Ira L. Place has been named vice-president and assistant sales manager; D. J. MacGillis, general sales manager; Rudy Stockinger and Robert Riha, assistant sales managers; Melvin Young, plant superintendent, and Otto Kollath, superintendent of the chemical division.

Firestone Forms Venezuelan Plant

Plans for construction of a $4,000,000 tire and tube manufacturing plant at Valencia, Venezuela, were recently announced by the Firestone Tire & Rubber Co. The new factory will have 100,000 square feet of floor space initially, and will be equipped to produce 150,000 passenger car and truck tires annually. When operating at capacity, the proposed plant will provide direct employment for about 275 people. The purchase of some raw materials locally will provide indirect employment for others. Under the corporate name of Companima Anonima Firestone Venezolana, the plant will be able to supply tires to meet the needs of local automobile assembly plants and Venezuelan motorists. The new plant will be the third tire and tube manufacturing plant to be built and operated by Firestone in South America. In 1931, tire production was started in Buenos Aires, Argentina, and in 1939, the plant at Sao Paulo, Brazil, started producing tires and tubes. Textile plants have also been added to these cities by Firestone to manufacture cord fabric for locally produced tires. H. G. Weilert, present manager of the Firestone branch in Caracas, Venezuela, is in charge of preliminary arrangements for the building project.

MPS-500 Vinyl Plasticizer

Hooker Electrochemical Co., Niagara Falls, N. Y., has introduced MPS-500, a new plasticizer for vinyl compounds. The product is a stabilized, chlorinated fatty acid ester. It is said to show excellent compatibility with vinyl chloride polymers and copolymers, and exerts a strong plasticizing action on them. MPS-500 is flame-retardant; has excellent low migration characteristics, and imparts very good electrical properties. Compositions containing MPS-500 show good flexibility at ordinary and low temperatures, good all-around mechanical properties and good processing characteristics. There is very low plasticizer loss on heating and on extraction with water and oil. Used alone, MPS-500 compares closely with tricresyl phosphate in efficiency. However, it is said to be superior to the latter in low-temperature flexibility. Its use with other plasticizers makes possible a wide range of desirable properties.

Trickie Trixie Rubber Doll

A new flexible rubber doll, with latex skin made by the Rubber Specialties Division of the Dewey & Almy Chemical Co., is being manufactured by the Sayco Doll Corp. of Brooklyn, N. Y. The body of the doll is stuffed with foam rubber. The combination of a rubber body with a wire skeleton makes it possible for the doll to be bent in any position and hold any pose. The seamless latex skin is made of natural rubber by the dip process. Features of latex dollskins are softness and washability, as well as lifelike feel and appearance. Called "Trickie Trixie," the doll stands 13 inches high, coos when squeezed, and comes in a variety of outfits.

OBITUARIES

Francis Adams Truslow

Francis Adams Truslow, former president of the New York Curb Exchange, and president of the Rubber Development Corp. during World War II, died on July 8 aboard the liner Argentina while en route to Brazil. He was 45 years old. Mr. Truslow was going to Brazil as United States Commissioner on the United States-Brazil Joint Commission for Economic Development. He had been appointed to the position on May 2 by President Truman, and had resigned as president of the Curb Exchange to accept the assignment. Early in World War II, Mr. Truslow went to Peru for the Rubber Reserve Company to explore the possibilities of drawing increased rubber supplies from the vast Amazon basin. In 1943, the Rubber Reserve Company's rubber procurement responsibilities outside the United States was shifted to the Rubber Development Corp., and the following year Mr. Truslow became its president. After the war he returned to New York to the practice of law. A native of Summit, N. J., Mr. Truslow was graduated from Yale University in 1928. He took his degree in law from Harvard University in 1932. In 1946, Mr. Truslow was elected president of the New York Curb Exchange. He maintained a keen interest in the development of the rubber industry and helped rewrite the corporation trust and navigation laws of the Republic of Liberia. He received decorations from both the Liberian and Peruvian governments. Mr. Truslow is survived by his wife, two sons and two daughters.

Richard H. Toeplitz

Richard H. Toeplitz, head of the L. W. Dumont Co., rubber brokers of 120 Wall St., New York, N. Y., died on July 20 at his home in Long Beach, L. I., N. Y. Mr. Toeplitz was born in New York and attended the College of the City of New York. He had been connected with the rubber business for more than 30 years, having started with the Crude Rubber Brokerage Co. as a partner. He was later president of the company. A veteran of World War I, Mr. Toeplitz was a member of the Rubber Trade Association, the Commodity Exchange in New York and the Delta Sigma Phi fraternity. His wife survives.

Paul F. Sise

Paul Fleetford Sise, chairman of the board of the Northern Electric Co., Ltd., died on August 2 in Montreal, Que., Canada. He was 71 years old. A native of Boston, Mass., Mr. Sise was a son of Charles Fleetford Sise, founder of the Bell Telephone Co. of Canada. He is survived by his wife, two sons and a daughter.

Edward Rogan

Edward Rogan, retired mill superintendent for the Habirshaw Cable & Wire Corp. in Yonkers, N. Y., died on July 21 at St. John's Riverside Hospital in Yonkers. He was 71 years old. During World War II, subordinates of Mr. Rogan were engaged for months in secretly processing miles of tubes that were later laid across the English Channel. After the allied forces invaded Normandy, millions of gallons of gasoline were pumped across the channel through these pipe lines. Mr. Rogan was born in England and came to the United States when he was three years old. In 1900 he went to work for the Western Electric Co. in New York City. In 1915 he entered the service of the Habirshaw Corp., and during the first World War was plant manager for the company. He was made general superintendent in 1921 and retired in 1945. A widower, Mr. Rogan is survived by his son and daughter.

Oscar G. Miller

Oscar George Miller, New York district sales manager for the Rome Cable Corp., died at his home in Rutherford, N. J., on July 8. He was 63 years old. Mr. Miller, a native of Buffalo, N. Y., was graduated from Cornell University in 1911. He joined the Standard Underground Cable Co. in 1917 as an office salesman. In 1928, the company merged with the General Cable Corp. in Rome, N. Y., for which Mr. Miller worked for eight years. With the formation of the Rome Cable Corp. in 1936, Mr. Miller became New York district sales manager, a position he held until his death. He was a member of the Cornell Club and the University Glee Club in New York, the American Institute of Electrical Engineering, and the Boiling Springs Lodge, F. and A.M., Rutherford, N. J. Funeral services were held at his home on July 10. His wife, a son and a daughter survive.

Joseph W. Roberts

Joseph W. Roberts, assistant comptroller of the Goodyear Tire & Rubber Co., died of a heart attack at his home in Akron, Ohio, on July 8. He was 58 years old. He had assumed his duties as assistant comptroller last April. Prior to his election, Mr. Roberts served as chief works accountant in charge of all domestic manufacturing operations. As assistant comptroller, he was in charge of factory accounting for all Goodyear rubber, plastic and cotton mills in the United States. Born on August 29, 1892 at Blue Rock, Ohio, Mr. Roberts was graduated from Meredith Business College at Zanesville, Ohio. He served in World War I, and was active in Masonic circles. His wife and son survive.

Clifton H. Carlisle

Clifton H. Carlisle, chairman of the board of the Dominion Bank in Toronto, Ont., Canada, and founder of the Goodyear Tire & Rubber Co. of Canada, died on July 27 in Toronto. He was 81 years old. Born in Ohio, Mr. Carlisle was a teacher for ten years before he joined Goodyear in the United States. In 1910, he was sent to Canada to form the Canadian company and was successively general manager, secretary-treasurer, vice-president and president. He was a director of Canadian General Investments, Ltd., and the Montreal Trust Co. He was a former president of the Dominion Bank. Mr. Carlisle retired as president of the Goodyear Tire & Rubber Co. of Canada in 1936 but remained a member of the board.

Dederick S. Dunwiddie

Dederick Stanley Dunwiddie, secretary-treasurer of Compania Goodyear del Peru, the Goodyear subsidiary in Lima, Peru, died on July 24 in Akron, Ohio, while on leave from his post. Born in Broadhead, Wisc., on May 8, 1908, Mr. Dunwiddie began service with Goodyear in 1934 as a clerk in the treasurer's office at Akron. He was named senior clerk in 1936 and two years later left for Brazil. The Goodyear factory was being constructed in Sao Paulo at that time and he served with the operating department there until 1941. He was next appointed operating manager for the Goodyear organization in Argentina and held this post until 1945. At that time he was named secretary-treasurer for Goodyear-Peru.

Sam Hershberg

Sam Hershberg, president of the Hershberg Products Co, Ashtabula, Ohio, died suddenly of a heart attack on June 22. He was 53 years old. Mr. Hershberg was well known in the storage battery industry. For many years he was associated with the Aetna Rubber Co. of Cleveland and Ashtabula, Ohio, rising to factory manager and comptroller. From 1932 to 1937, he was a partner and president of the Advance Rubber Co. at Akron, Ohio. After several years as general manager of the Dunne Rubber Co. at Ashtabula, he organized the Hershberg Products Co. in 1945, and served as president and general manager.

Edward H. Koken

Edward Harold Koken, former vice-president and general manager of the Goodyear Tire & Rubber Co. of Canada, Ltd., died on July 28 at Peterborough, Ont., Canada. He was 76 years old. Born in Bethlehem, Penna., Mr. Koken was educated at Plymouth, Ohio. He began his business career with the Goodyear company in Akron and moved to Bowmanville, Ont., in 1913 as superintendent of the Goodyear plant there. In the same year, he went to the New Toronto, Ont., plant and remained there until his retirement in 1944.

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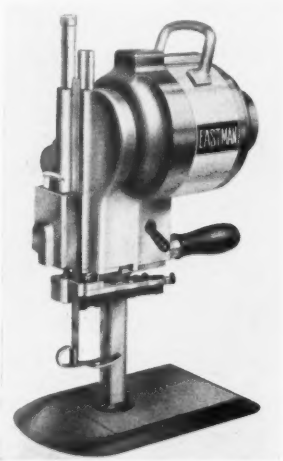
NEW EQUIPMENT

Eastman Blue Streak Cutter

Equipped with automatic sharpening belts, the new Blue Streak Straight Knife Machine manufactured by the Eastman Machine Co., Washington & Goodell Sts., Buffalo 3, N. Y., assures keen knife edges at all times. Eastman's flat-bevel grinding gives strength to the cutting edge, retaining its sharpness for a longer period. The entire weight of the machine is suspended in rubber



to eliminate vibration. The crossheads are of die-steel, precision ground and lapped to a mirror finish, for frictionless operation. With the straight knife edge, the machine is suited to the cutting of solid rubber. However, when fitted with a wave edge knife, the machine is fitted for cutting foam rubber. In this case, the machine is also equipped with a newly-developed "Diamond Back" base plate. When the scored base plate surface is powdered, it enables the machine to pass underneath the rubber surface freely and prevents the rubber from adhering to the plate surface. The unit as illustrated is equipped with a straight knife and standard base plate.

Dowtherm Heat Transfer Units

With capacities ranging from 100,000 to 500,000 BTU's per hour, a new standard line of electrically heated Dowtherm heat transfer units has been developed by the Struthers Wells Corp., Warren, Penna. Supplied complete with instruments, piping, insulation and other accessories, these heaters have a temperature range to about 750°F. using Dowtherm as a liquid or vapor medium. In addition, other heat transfer fluids may be utilized in this equipment. The entire unit may be base mounted at the factory or supplied with all essential equipment for mounting. The units include a special heating element, designed to eliminate thermal breakdown or coking troubles.

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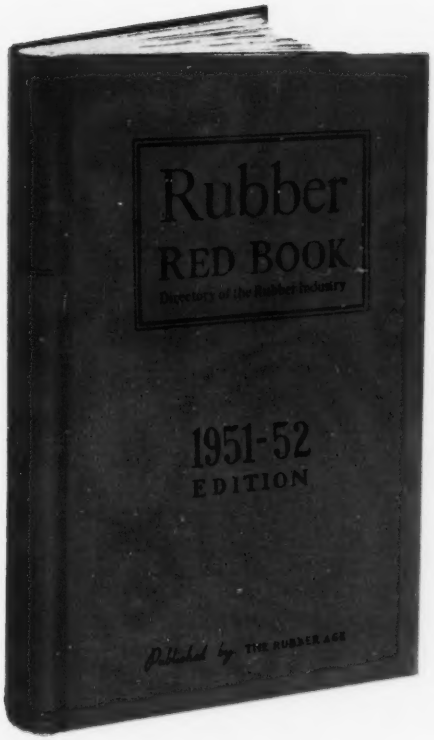

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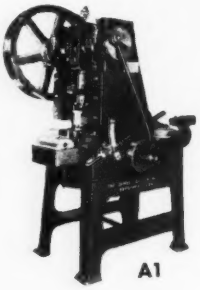
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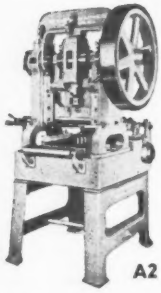
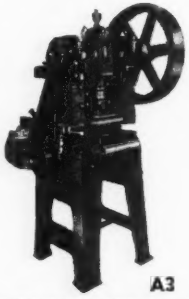

A2

MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.

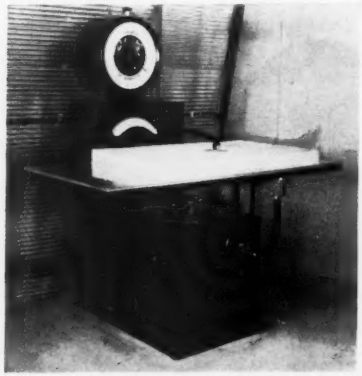
MODEL A-2s
(Not illustrated)
Cutting across grain of stock.


A3

COULTER PRODUCTION MACHINES SINCE 1896

Foam Latex Compression Tester

Simplicity of operation is a feature of the Foam Latex Compression-Indentation Tester produced by the Ferry Machine Co., Kent, Ohio. Testing consists of measuring the load necessary to produce a 25% indentation in the test sample. The test sample is inserted between a perforated table and a flat circular indentor foot 50 square inches in area, connected to a load measuring device and so arranged that the sample can be deflected at an approximate rate of 25 inches per minute. The test sample should be a minimum of 12 by 12 inches in plain view dimensions.



The indentor foot is brought in contact with the specimen and the initial thickness noted at a preload of one pound on the load scale. The specimen is then compressed 25% of this initial thickness and the final load in pounds is read about five seconds after the foot has come to rest. In the case of extremely accurate checks, it is necessary to take into account the temperature and the humidity at the time of reading.

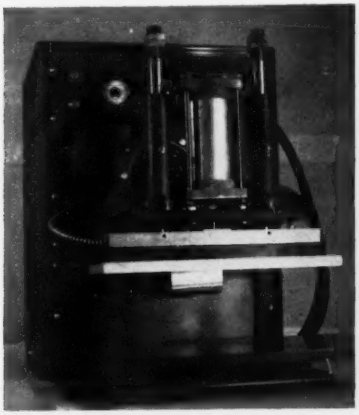
The unit has a front width of 72 inches and is 48 inches deep and 55 inches high. It utilizes a 220 volt, 3-phase, 60 cycle A.C. Standard motor. The weighing platform is of ¾-inch plywood, 36 by 72 inches, with a smooth varnished surface perforated with a regulation test hole pattern. The unit uses a Toledo scale with a range of 0 to 100 pounds in one-tenth pound increments. Test piece thickness ranges from a maximum of 5 inches to a minimum of ½-inch.

Tyler 15-Inch Bandsaw Models

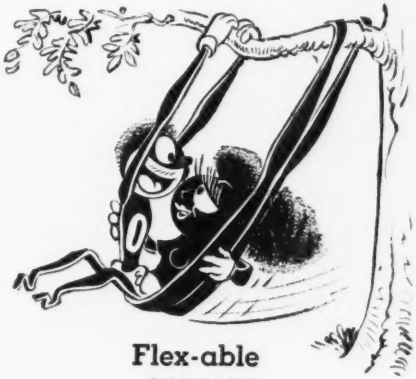
Three new 15-inch bandsaw models incorporating several advancements in design and performance have been announced by the Tyler Manufacturing Co., Inglewood, Calif. The new units provide speed ranges from 80 to 5000 fpm by a simple turn of a hand-crank. There are no belts to change and no gears to shift. A speed indicator is located at eye level so that the operator can tell at a glance blade speed of the unit. Supplied with each bandsaw machine are special Spyral guides designed to give quick and easy changeover for the use of either Tyler Spyral blades or the conventional flat blade. The Spyral blade can be used for special cuts in virtually any materials, including sponge rubber, plastics, wood and most metals.

Economy Electronic Heat Sealer

Designed for the electronic heat sealing of plastic film and sheeting, the Economy model heat sealing unit produced by Progressive Electronics Co., 130 Eighth St., Passaic, N. J., is said to eliminate waste of high frequency energy resulting in a phenomenal increase in



sealing capacity. The unit features bench mounting and a grounded work bed 24 by 14 by ¾ inches. It has a rigid 17 x 5-inch die mounting plate and a de-mountable die bar holder. Other features of the unit include a foot-operated air valve and automatic heat control timer 0-15 sec. The air requirements of the unit are .5 to 2.0 cubic feet per minute. Power input is 220 volts, 30 amps., 60 cycles single phase. Weighing 300 pounds, the unit is 29 inches high, 21-inches wide and 35 inches deep.



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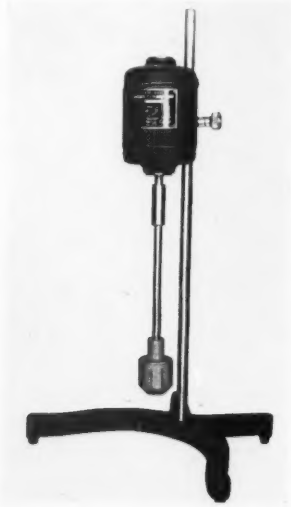
Simplex Dispersator Mixing Unit

A new and revolutionary mixing device, the Simplex Dispersator, is now being manufactured by the Premier Mill Corporation of Geneva, New York. Designed for processing operations where propellers are generally ineffective, the Dispersator can be used for speedy emulsification, dispersion and intimate mixing. Tests have



demonstrated that the Dispersator achieves satisfactory results in a fraction of the time needed for other types of high-speed agitators or mixers. Operations tested are: building up of emulsions and dispersions, acceleration of chemical reactions, prevention of settling out, speed-up in preparation of solutions, and for many processes involving intimate mixing and agitation.

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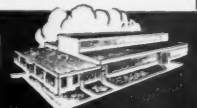

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REVIEWS

BOOKS

Industrial Wastes: Their Conservation and Utilization. By Charles H. Lipsett. Published by the Atlas Publishing Co., 425 West 25th St., New York 1, N. Y. 6⅛ x 9¼ in. 317 pp. $5.00.

A comprehensive analysis of all the important industrial wastes, their vital role in the economic life of the country as well as a description of the origins of the various wastes are outlined in this volume. Methods used in collecting wastes, marketing procedures, recovery processes and utilization by industry are outlined. Written in an easy-to-read style, the book ranges over a wide field of essential wastes including rubber, chemicals, plastics, metals, textiles, leather, etc., as well as organic wastes, paints and solvents, agricultural wastes, and others. Chapters of the book are devoted to rubber scrap, rubber scrap processing and foam rubber.

•

Aus Der Praxis Des Gummifachwerkers. (Rubbermaking Practice). (2nd Revised Edition). By Dr. Ing. Karl Mau. Published by the Berliner Union, Buch-und Zeitschriftenverlag, Stuttgart-N., Germany. 6¼ x 9¼ in. 332 pp. DM 40.00 (Approximately $10).

Designed for non-technical personnel, this book outlines the basic principles of rubber technology. The fundamental concepts of physics and chemistry are discussed. Sources of raw materials and their properties are also considered. Other factors covered include the history of rubber, production techniques, compounding materials and methods of vulcanization as well as methods of compounding and processing. Conventional rubber machinery is described in some detail. Some of the most important methods of testing rubber are considered. The book also discusses the latest developments in synthetic rubber and related polymers. F.P.

•

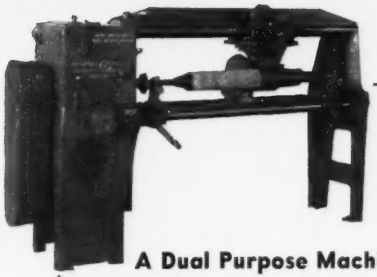
Kunstleder-Handbuch. (Synthetic Leather Manual). (2nd Revised Edition). By Walter M. Muenzinger. Published by the Wilhelm Pansegrau Verlag, Berlin-Wolmersdorf, Germany. DM-30. (Approximately $7).

The history, applications and manufacturing processes of modern synthetic leathers are described in this book. The book deals with both plastic film forming materials as well as supporting fabrics. The proper uses of solvents, plasticizers, fillers and pigments are discussed. One chapter of the book is devoted to the manufacture of synthetic leather from natural and synthetic rubbers. The use of scrap leather is described in another chapter. Conventional testing methods are also described. The book contains tables of raw materials and their physical and chemical properties. The extensive bibliography covers only German publications. F.P.

•

Science French Course. By C. W. Paget Moffatt. Revised by Noel Corcoran. Published by the Chemical Publishing Co., 212 Fifth Avenue, New York 10, N. Y. 4¾ x 7½ in. 331 pp. $4.75.

This book is a self-teaching manual for learning how to read and understand scientific French within a few weeks. The well-selected grammar is kept to a minimum. The major part of the book is devoted to articles taken from every important branch of science: physics, chemistry, mathematics, botany, zoology, geology, geography, physiology, psychology, anthropology, and military science. The reading matter has been abstracted from the most recent technical and scientific literature. A detailed alphabetical vocabulary eliminates the necessity of a dictionary.



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REVIEWS (CONT'D)

Techniques of Plant Maintenance: 1951. Published by Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N. Y. 8½ x 11 in. 228 pp. $6.00.

This volume comprises the proceedings of the Conference on Plant Maintenance which was held concurrently with the Plant Maintenance Show in January, 1951. More than forty nationally known experts in the field of maintenance contributed papers. One of the features of the book is a series of questions and answers submitted after each of the twelve sessions held at the conference. In all, 544 questions put to the speakers are answered. Subjects covered include preventive maintenance, inspection procedures and frequencies, records and reports, training personnel for maintenance, organization and management for maintenance, maintenance costs, incentive payment of maintenance workers, planning and scheduling maintenance operations, applied lubrication in industry, housekeeping, painting and decorating, floors and standards of sanitation. In addition, there are specialized discussions on maintenance of electrical equipment, power plant and heating equipment, problems of the small plant, selection and maintenance of lighting equipment, maintenance in chemical plants, in metal plants, and others.

•

Viscosity and Plasticity. By E. N. da C. Andrade. Published by the Chemical Publishing Co., 212 Fifth Avenue, New York 10, N. Y. 5½ x 8¾ in. 84 pp. $2.25.

The phenomena of viscosity and plasticity are outlined in this book. The subject is covered with a special view to those who deal with viscous and plastic materials on an industrial scale, particularly paint technologists. The booklet is divided into three lectures originally presented by the author before the Oil and Colour Chemists' association at the University of London. Lecture I discusses the nature and theories of liquid viscosity. It aims at establishing general principles and deriving from these an understanding of the very complex behavior of flowing liquids and solids. Lecture II deals with the flow of simple liquids, suspensions and gels. It also considers thixotropy, dilatancy and other properties affecting flow. Lecture III is concerned with the flow of solids. It covers sols and gels which can be poured slowly or with difficulty. The book is illustrated with charts and graphs.

BOOKLETS, CATALOGS, etc.

The Aquarexes: Surface Active Agents. (Report No. 51-2). By E. P. Hartsfield and J. C. Fitch. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9⅜ in. 16 pp.

The use of the Aquarexes in latex processes and as mold and stock lubricants is described in this technical bulletin. The physical and chemical properties of the different Aquarexes are discussed and their use as latex stabilizing agents, wetting agents, elastomer processing aids, mold lubricants, etc., is elaborated upon. The bulletin presents much of its information in the form of tables and charts.

•

K-P Spiral Woven Wire Conveyor Belts. (Catalog No. 31). Korb-Pettit Wire Fabrics and Iron Works, Inc., 1505-15 North Mascher St., Philadelphia 22, Penna. 8½ x 11 in. 40 pp.

Standard and special types of wire belting weaves are illustrated and described in this catalog. Power formulae and construction details are fully covered as are suggestions for prolonging belt life and increasing efficiency. Sections of the catalog are devoted to proper belt selection and to installation and operation of wire mesh conveyor belts. Engineering services offered by the company are also discussed.

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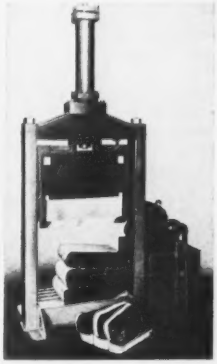

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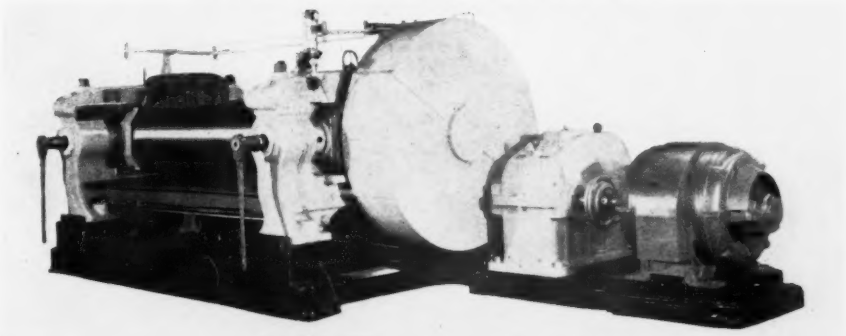

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Accepted General Specification for Latex Foam Rubber Articles. British Latex Foam Manufacturers' Association, The Royal Exchange, Cross St., Manchester 2, England. 7⅜ x 9¾ in. 12 pp.

General specifications which have been accepted by the British Latex Foam Manufacturers' Association for latex foam rubber articles are outlined in this booklet. The objects of the specifications are presented and the scope outlined. Definitions and arrangement of the specifications conclude the introductory portions. General test and specifications for whole articles are then covered as to appearance and condition, dimensions, hardness index, compression set, and joining with solution. A specification for accessory items such as tacking strips is also discussed. Tests on the intrinsic properties of foam rubber are next outlined. Under this heading such factors as tensile tests, accelerated aging, copper content, etc., are discussed. There are two appendices to the booklet, one of which concerns itself with determination of the hardness index, while the other deals with estimation of copper in latex foam rubber.

•

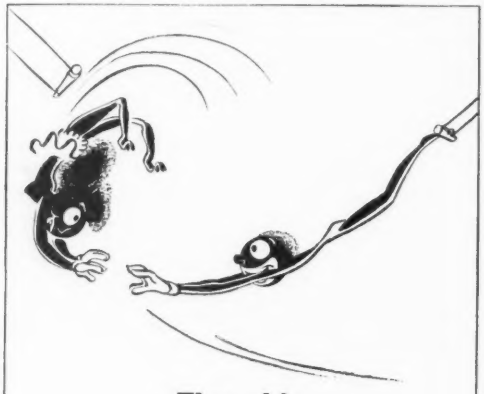
Safety Pays the Smaller Business. National Safety Council, 425 North Michigan Ave., Chicago 11, Ill. 6 x 9 in. 24 pp.

The importance of industrial safety for the small manufacturing concern is emphasized in this booklet which gives considerable data on the direct and indirect costs of accidents. Both problem and solution are presented, with the role played by such agencies as insurance carriers, labor departments, associations and the National Safety Council emphasized. A few case histories are included. The booklet, in pointing up the problem, indicates that in 1949 the accident frequency rate for small business, employing less than 100 people, was 22.50, against 8.95 for large business, employing over 500 people.

•

Elmes Minimatic Molding Presses. Elmes Engineering Division, American Steel Foundries, 1150 Tennessee Avenue, Cincinnati 29, Ohio. 8½ x 11 in. 4 pp.

This booklet covers the new "pint size" plastic molding press produced by the company. The manner in which the press operates is described and complete specifications are supplied. The booklet also lists cylinders which are available with the basic press. Special accessories which are available for use with the press are also described. A full-page photograph illustrates the press.



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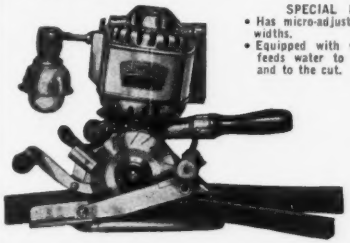

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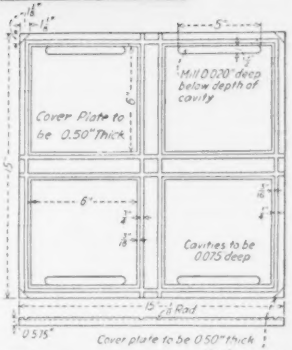
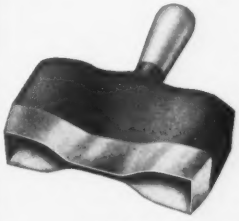

Cover Plate to be 0.50" Thick
Mill 0.070" deep below depth of cavity
Cavities to be 0.075 deep
Cover plate to be 0.50" thick
Mill four corners 8 deep for prying mold apart



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Rubber and Synthetic Rubber Compounds. (BL-242). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in. 32 pp.

This report shows recommended natural rubber, GR-S, and neoprene formulae to meet the Type R and Type S, Class SC, requirements of A.S.T.M. D 735-51T and S.A.E. Standard R-10, "Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications". These compound recommendations also will be found applicable to Military Specification MIL-R-3065 and to many mechanical rubber goods applications whether or not directly covered by specifications. Recommended compositions and test results for Type R in 30, 40, 50, 60, 70, 80, and 90 Durometer hardness grades are shown. Recommended compositions for Type S, Class SC in 40, 50, 60, 70, 80, and 90 Durometer hardness grades are also shown.

•

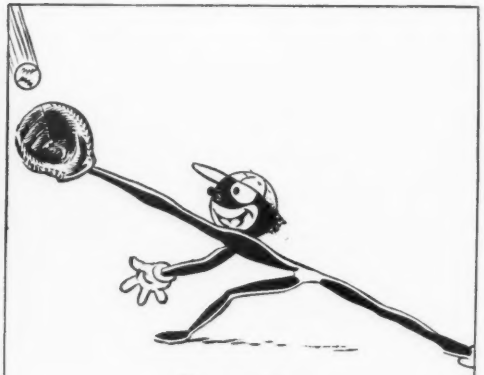
Precision Speed Control with the Adjustable-Speed Magnetic Drive. (4400-TEC-1107). Electric Machinery Manufacturing Co., Minneapolis 13, Minn. 8½ x 11 in. 32 pp.

Complete information both on the Magnetic Drive and the new Magnetic Amplifier Regutron Speed Control manufactured by the company are described in this bulletin. A fully illustrated section of the bulletin covers the application of the Magnetic Drive and Regutron Control in industry. The different types of construction used in the manufacture of magnetic drives are discussed and illustrated. Complete specifications are provided for all units discussed, while cutaway drawings, charts, photographs and diagrams aid in an understanding of the units' appearance and operation.

•

Flexamine: A Superflexing Antioxidant. (Compounding Research Report No. 15). Naugatuck Chemical Division, U. S. Rubber Co., Rockefeller Center, New York 20, N. Y. 8½ x 11 in. 12 pp.

This report represents a revision of Compounding Research Report No. 4, previously issued. The chemical and physical characteristics of the antioxidant are discussed as are its compounding properties. Some typical formulations utilizing the material are presented. Test results on these compounds are presented in tabular or graph form. Some of the typical formulations in which Flexamine finds use which are described in this report include belt stocks, shoe soling compounds, wire stocks, truck tread compounds, etc.



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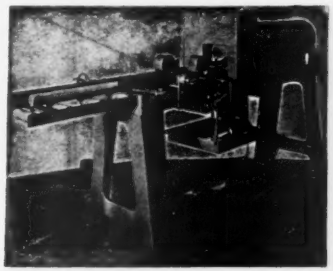

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MARKETS

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Natural Rubber

According to trade sources, nothing has been forthcoming from official Washington to indicate a change in the over-all rubber situation in the United States. Stockpile buyers have not been too active for the past few weeks. Some buying has been taking place in Singapore by manufacturers, presumably for the U. S. stockpile, but it is known that the volume of business in the past few weeks has been exceedingly small.

It is also known that sales are being made in Indonesia, at least in the top grades, at prices considerably above those which are quoted in the United States. Naturally, this precludes the likelihood of such rubber being diverted to the United States, at least for the near future.

The inactivity on the part of sellers on fresh rubber commitments can be largely attributed to a strong technical position abroad. For the last month or so there has been considerable short covering. This type of buying persists in all primary centers. The short interest in rubber has been almost universal as far as the dealer trade was concerned, and for that matter the same was true with many shippers in the East. Consequently, the disposition to take back previous short commitments has kept the primary markets relatively firm.

Widespread attention is being directed to reports indicating an oversupply of liquid latex on hand, particularly as far as bulk storage tanks on the coastal ports are concerned. From various directions stress is being placed on the feasibility of the government control order on liquid latex being removed as such will effect economies in operation as well as aid in permitting long-range planning for uses for this commodity.

Sir Hartley Shawcross, president of the British Board of Trade, recently stated that 6,194 tons of raw rubber were re-exported from Britain to Russia in the first half of 1951. In a written answer to a House of Commons question, Sir Hartley said 15,661 tons of rubber were exported from Malaya and Singapore to Russia. "In addition," he said, "a very small amount valued at £86,000 was trans-shipped under bond in the United Kingdom. Small amounts may also have been shipped or trans-shipped from other British ports."

Malayan rubber production in June totaled 55,453 tons, compared with 46,664 tons in May, but the apparent jump of 8,789 tons was largely offset by the quarterly deduction of 7,653 tons on account of adjustment of smallholders' production in the second quarter. Total production in the first six months of 1951 amounted to 307,206 tons, against 384,206 in the first half of 1950 and 308,379 in the second half of 1950. Estate production in June totaled 28,141 tons. Estate production in the first half of 1951 totaled 163,430 tons. Smallholders' production in June totaled 27,312 tons, and in the first six months of 1950, 143,683 tons.

Quotations for the markets in London and Singapore follow:

London Market

(Standard Smoked Sheets)

September	51.92 - 52.50
October	49.00 - 49.58

Singapore Market

(Standard Smoked Sheets)

September	45.65 - 45.83

NEW YORK, AUGUST 8, 1951

Scrap Rubber

In CPR 59, effective August 6, the Office of Price Stabilization ordered rollbacks in the ceiling prices of scrap rubber. New ceilings for scrap tires, tire parts and scrap tubes reflect present market prices while the ceilings set for other kinds of scrap rubber represent prices existing in December of 1950, OPS said. They constitute rollbacks from the GCPR price ceilings in effect since January 26, 1951. A complete account of the scrap rubber price order will be found elsewhere in this issue. The new ceiling prices follow:

(Prices Delivered Akron)

Mixed tires ton	$26.00
Mixed beadless tires ton	34.00
Light colored carcass ton	130.00
Black carcass ton	50.00
No. 1 peelings ton	65.00
No. 2 peelings ton	42.00
No. 3 peelings ton	38.00
Buffings ton	30.00
Truck and Bus S.A.G. ton	28.00
Passenger S.A.G. ton	28.00
Mixed S.A.G. ton	26.00
Light colored tubes lb.	.16
Natural rubber red tubes lb.	.16
Natural rubber black tubes lb.	.11½
Mixed natural rubber tubes lb.	.10
Butyl rubber tubes lb.	.057
GR-S rubber tubes lb.	.02
Mixed synthetic tubes lb.	.03

Reclaimed Rubber

The Office of Price Stabilization, on August 6, issued a new regulation, CPR 58, setting new ceilings for reclaimed rubber. A full account of the new order will be found elsewhere in this issue. The ceilings for whole tire reclaim are the same as those fixed by GCPR, while ceilings for natural tube and light colored carcass reclaim were set "considerably below" the GCPR ceilings, which had fixed ceilings at the highest level prevailing from December 19, 1950, through January 25, 1951. The new ceiling prices per pound follow:

(Prices for All Areas Except Calif.)

Premium Grade Whole Tire	.10½
First Line Whole Tire	.10
Second Line Whole Tire	.09½
Third Line Whole Tire	.09¼
Fourth Line Whole Tire	.08¾
Black Carcass	.14½
No. 1 Light Colored Carcass	.20¼
No. 1 Select Peel	.11¾
No. 1 Peel	.10½
Butyl Tube Reclaim	.14½
S.P. Natural Rubber Black Tube	.21
Natural Rubber Black Tube	.20
Natural Rubber Red Tube	.24¼
Natural Rubber Gray Tube	.24¼

Cotton Tire Fabrics

What with the decline in cotton prices during the past few weeks, trade sources expect a leveling off on cotton tire fabric prices within the next few weeks. Now that a large cotton crop is virtually assured, industry spokesmen feel there will be a clearing of the hesitancy which has been marking the field for the past few months when most suppliers had withdrawn from the market. Recent quotations follow:

Standard, Peeler, 12/4/2 lb.	.95
Extra Staple, Peeler, 12/4/2 lb.	1.00

Chafers

14.4 oz. (per sq. yard) lb.	.86½
9.25 oz. (per sq. yard) lb.	.83
11.65 oz. (per sq. yard) lb.	.81
8.9 oz. (per sq. yard) lb.	.84

Cotton

The price of middling uplands on the New York Cotton Exchange has swung in a range of 8.71c since our last report (July 6), high for the period being 44.66c, reached on July 9, and low being 35.95c, reached on August 8. The average price of middling uplands for the month of July was 41.21c based on 21 trading days. This compares with an average of 46.06c in the month of June.

The Crop Reporting Board of the Department of Agriculture, in its first cotton crop estimate of the 1951 season, issued on August 8, placed the indicated production as of August 1 at 17,266,000 bales of 500 pounds gross weight each. The estimate compares with production of only 10,012,000 bales last year and the ten-year (1940-1949) average of 12,030,000 bales.

The indicated production is the third largest on record, exceeded only by the 1926 crop of 17,977,000 bales and the 1937 crop of 18,945,000 bales. The official estimate of 17,266,000 bales as of August 1 is the largest ever issued for that date. In previous years of very large crops, the ginnings proved to be substantially larger than the August crop estimate.

Concurrent with the forecast of the bumper crop, the Department of Agriculture eased restrictions on exports of cotton. Rigid export quotas will be replaced by an "open-end" export licensing system under which friendly countries can get all the cotton they want. This system will permit the government to bar shipments to unfriendly areas.

Cotton was placed under export controls last fall, when last year's poor crop, coupled with increased demands under the defense production program, raised the threat of a shortage. The department had previously announced a preliminary export allocation of 3,500,000 bales from this year's supply. These allocations were in effect set aside by the action of August 8.

Quotations for middling uplands on the Exchange follow:

	July 6	August 8		
	Close	High	Low	Close
Oct.	37.45	34.45	34.12	34.35
Dec.	37.15	34.47	34.12	34.34
Mar.	37.18	34.47	34.15	34.36

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.465 - .475
Butaprene NL	.475 - .485
Butaprene NAA	.515 - .525
Butaprene NXM	.550 - .560
Chemigum 30N4NS	.400 - .470
Chemigum 50N4NS	.400 - .470
Chemigum N3	.450 - .520
GR-I	—— - .2075
GR-S	—— - .245
Hycar OR-25	.450 - .460
Hycar OR-15	.520 - .530
Hycar OS-10	.500 - .510
Neoprene Types CG and AC	—— - .500
Neoprene Type E	—— - .650
Neoprene Types FR and KNR	—— - .800
Neoprene Type GN	—— - .380
Neoprene Type GN-A	—— - .380
Neoprene Type RT	—— - .400
Neoprene Type S	—— - .380
Neoprene Type W	—— - .400
Paracril B	.500 - .510
Paracril BJ	.500 - .510
Paracril C	.580 - .590
Silastic (compounded)	2.35 - 4.40
Thiokol Type A	—— - .470
Thiokol Type FA	—— - .640
Thiokol PR-1	—— - .950
Thiokol Type ST	—— -1.000

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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

AUGUST 7, 1951

Prices are, in general, f.o.b. works. Range of prices indicates grade or quantity variations.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; l.c.l., less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

[a] East of Mississippi.
*For Export Only

—The arrangement of this section follows closely the Chemical Section of the 1951-52 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.

—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.

ACCELERATORS

A-1 (Thiocarbanilide)	lb.	.44	-	.51
A-32	lb.	.59	-	.69
A-77	lb.	.42	-	.55
A-100	lb.	.42	-	.55
Accelerator No. 8	lb.	——	-	.98
Accelerator—49	lb.	.48	-	.49
Accelerator—89	lb.	——	-	1.20
Accelerator—122	lb.	——	-	1.30
Accelerator—552	lb.	——	-	2.00
Accelerator—808	lb.	.59	-	.61
Accelerator—833	lb.	1.13	-	1.15
Altax	lb.	.37	-	.40
Ancap*	lb.	.27	-	.29
Ancatax*	lb.	.35	-	.37
Ancazide* ET	lb.	——	-	1.00
ME		——	-	1.10
Ancazate* BU (ET & ME)	lb.	——	-	1.00
Arazate	lb.	——	-	2.16
Beutene	lb.	.59	-	.61
Bismate, Rodform	lb.	——	-	3.00
Butasan	lb.	——	-	1.00
Butazate	lb.	——	-	1.00
Butyl Eight	lb.	1.00	-	1.25
Captax	lb.	.29	-	.32
C-P-B	lb.	——	-	1.95
Cumate, Rodform	lb.	——	-	1.45
Dibenzo G-M-F	lb.	——	-	2.50
Diorthotolylguanidine	lb.	.52	-	.53
Diphenylguanidine	lb.	.43	-	.44
El-Sixty	lb.	.45	-	.52
Ethasan	lb.	——	-	1.00
Ethazate	lb.	——	-	1.00
Ethex	lb.	——	-	1.00
Ethyl Thiurad	lb.	——	-	1.00
Ethyl Tuex	lb.	——	-	1.00
Ethylac	lb.	.88	-	.90
G-M-F	lb.	——	-	2.50
Good-rite Erie	lb.	.35	-	.37
Guantal	lb.	.47	-	.54
Harvex	lb.	.52	-	.57
Hepteen	lb.	.42	-	.44
Base	lb.	1.80	-	1.85
Ledate, Rodform	lb.	——	-	1.00
Mercaptobenzothiazole	lb.	.34	-	.36
Mercaptobenzothiazyl Disulfide	lb.	.42	-	.44
Mertax	lb.	.44	-	.51
Methasan	lb.	——	-	1.00
Methazate	lb.	——	-	1.00
Monex	lb.	——	-	1.10
Mono Thiurad	lb.	——	-	1.10
Morfex	lb.	.59	-	.61
2-MT	lb.	——	-	.75
NA-22 (for neoprene)	lb.	——	-	1.50
O-X-A-F	lb.	.43	-	.45
Pentex	lb.	——	-	1.00
Flour	lb.	——	-	.20
Permalux (for neoprene)	lb.	——	-	1.85
Phenex	lb.	.40	-	.45
Pipazate	lb.	——	-	1.53
Pip-Pip	lb.	——	-	2.00
R-2 Crystals	lb.	——	-	1.95
Rotax	lb.	.42	-	.44
RZ-50	lb.	——	-	1.00
SA 52	lb.	——	-	1.10
SA 57	lb.	——	-	1.00
SA 62	lb.	——	-	1.00
SA 66	lb.	——	-	1.45
SA 67	lb.	——	-	1.00
SA 77	lb.	——	-	1.00
Safex	lb.	——	-	1.15
Santocure	lb.	.64	-	.71
Selazate	lb.	——	-	1.45
Selenac (Ethyl, Methyl)	lb.	——	-	1.45
Setsit-5	lb.	.75	-	1.00
SPDX-GH (tons)	lb.	.64	-	.66
GL		——	-	.95
Tellurac	lb.	——	-	1.45
Tepidone	lb.	——	-	.55
Tetrone	lb.	——	-	1.25
A	lb.	——	-	1.85
Thiofide	lb.	.42	-	.49
Thionex	lb.	——	-	1.10
Thiotax	lb.	.34	-	.41
Thiurad	lb.	——	-	1.10
Thiuram E	lb.	——	-	1.00
M	lb.	——	-	1.10
Trimene	lb.	.54	-	.56
Base	lb.	1.03	-	1.06
Tuads, Ethyl	lb.	——	-	1.00
Tuads, Methyl	lb.	——	-	1.10
Tuex	lb.	——	-	1.10
Ultex	lb.	1.00	-	1.05
Unads	lb.	——	-	1.10
Ureka Base	lb.	.63	-	.70
Ureka C	lb.	.68	-	.75
Vitasan Crystals	lb.	.48	-	.53
Vulcanex	lb.	——	-	.53
Z-B-X	lb.	——	-	2.45
Zenite	lb.	.42	-	.44
A	lb.	.50	-	.52
B	lb.	.50	-	.52
Zenite Special	lb.	.43	-	.45
Zetax (uncoated)	lb.	.38	-	.41
Zimate, Butyl	lb.	——	-	1.00
Zimate, Ethyl	lb.	——	-	1.00
Zimate, Methyl	lb.	——	-	1.00

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.13¾	-	.14¼
Fish Oil, Hydrogenated, Fatty Acid				
Hydrofol Acid (dlvd.)	lb.	.12½	-	.15½
Hyfac 430 (dlvd.)	lb.	.17¾	-	.19
Neo-Fat H.F.O. (dlvd.)	lb.	.14½	-	.15¾
Stearex Beads (dlvd.)	lb.	.12	-	.13¾
Lime, Hydrated				
Arrowhead	ton	——	-	20.65
Marblehead	ton	——	-	14.30
Sierra	ton	——	-	19.50
Litharge				
Eagle (dlvd.)	lb.	——	-	.1875
FSB (dlvd.)	lb.	——	-	.2050
Magnesium Oxide, Heavy				
General Magnesite 500	lb.	.05	-	.06½
600	lb.	.06	-	.08
Michigan No. 15	lb.	.0550	-	.0600
Permanente	lb.	.05	-	.06½
Magnesium Oxide, Light				
Baker's (Neoprene Grade)	lb.	——	-	.31
General Magnesite (Neoprene Grade)	lb.	——	-	.30
General Magnesite No. 101	lb.	——	-	.19
General Magnesite Standard	lb.	——	-	.22
K & M (Neoprene Grade)	lb.	——	-	.31
Maglite D	lb.	——	-	.25
M	lb.	——	-	.31
Marine's (Neoprene Grade (l.c.l.)	lb.	——	-	.31
Michigan No. 30	lb.	——	-	.24
No. 40 Extra Light	lb.	——	-	.31
Witco Extra Light	lb.	.32	-	.35

ACTIVATORS (Cont'd)

Oleic Acid				
Emersol 210 (dlvd.)	lb.	.16½	-	.17½
L.C.P. Red Oil	lb.	.16¼	-	.17½
Red Oil (20-24 Saponified) (dlvd.)	lb.	.23½	-	.24¼
Palm Oil Fatty Acid (c.l.)	lb.	.11½	-	.14½
Potassium Oleate (drums)	lb.	.45	-	.55
Red Lead				
Eagle	lb.	——	-	.1975
No. 2 RM (dlvd.)	lb.	——	-	.2150
Sodium Laurate, 75%	lb.	.64	-	.74
Sodium Oleate, 75%	lb.	.45	-	.55
Paste (drums)	lb.	——	-	.20
Sodium Stearate, 75%	lb.	.45	-	.55
USP Grade (drums)	lb.	——	-	.37
Stearic Acid, Single Pressed				
Emersol 110 (dlvd.)	lb.	.14¼	-	.15½
Groco 53	lb.	.14¼	-	.15½
Stearex B (dlvd.)	lb.	.15½	-	.16¾
Stearic Acid, Double Pressed				
Alba (dlvd.)	lb.	.23¼	-	.25½
Groco 54	lb.	.14¾	-	.16
S-2-A (dlvd.)	lb.	.21	-	.23¼
S-2-B (dlvd.)	lb.	.19½	-	.21¾
Stearic Acid, Other				
Neo-Fat 1-58	lb.	.1190	-	.1315
1-60	lb.	.1400	-	.1525
1-65	lb.	.1450	-	.1575
White Lead Basic Carbonate	lb.	.18½	-	.19½
White Lead Basic Sulfate	lb.	.13¼	-	.14¾
Zinc Laurate				
Laurex	lb.	.29	-	.30
Zinc Stearate	lb.	.41	-	.43
Aquazinc	lb.	.26	-	.35

Unclassified Activators

Actifat (dms.)	lb.	——	-	.18
Aktone	lb.	.20	-	.21
Barak	lb.	——	-	.60
Curade	lb.	.57	-	.59
D-B-A	lb.	——	-	1.95
Delac J	lb.	.55	-	.57
Dibutylamine (dlvd.)	lb.	.54¾	-	.55¼
MODX-B	lb.	.20	-	.25
NA-11	lb.	——	-	.65
Polyac	lb.	——	-	1.60
Ridacto (drums)	lb.	.25	-	.26
Snodotte (dlvd.)	lb.	.15	-	.16¼
SOAC (min. 10 dms.)	cwt.	——	-	8.00
SOAC-KL (min. 10 dms.)	cwt.	——	-	8.00
Vulklor	lb.	.75	-	.85

ANTI-COAGULANTS

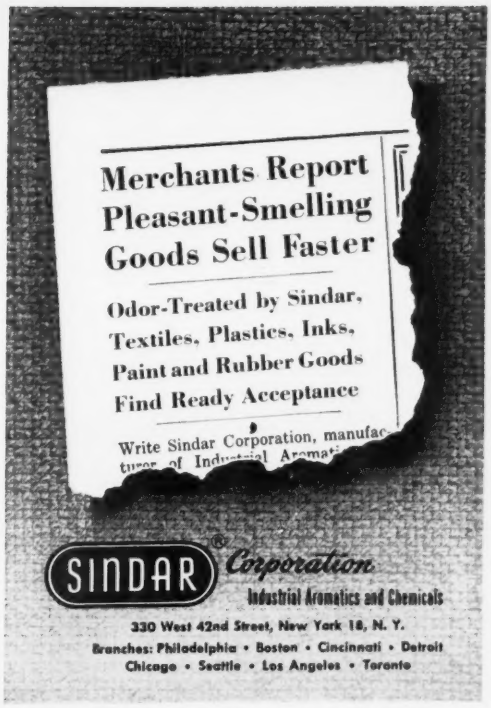
Anhydrous Ammonia (l.c.l.)	lb.	.17	-	.21
Aqua Ammonia (dms.)	lb.	.031	-	.035
M.B.M. (l.c.l.)	lb.	——	-	.35

ANTI-FOAMING AGENTS

Aero Anti Foam H	lb.	——	-	.12½
Regular	lb.	——	-	.08½
D.C. Antifoam A	lb.	5.65	-	6.65
Defoamer 630	lb.	——	-	.12½
Modicol A	lb.	.12	-	.15
B	lb.	.35	-	.40

ANTI-OXIDANTS

Agerite Alba	lb.	2.20	-	2.30
Gel	lb.	.60	-	.62
Hipar	lb.	.91	-	.93
H. P.	lb.	.67	-	.69
Powder	lb.	.49	-	.51
Resin	lb.	.65	-	.67
Resin D	lb.	.49	-	.51
Stalite	lb.	.49	-	.51
White	lb.	1.40	-	1.50
Akroflex C	lb.	.67	-	.69
F	lb.	.67	-	.69
Aminox	lb.	.49	-	.51
Antioxidant 2246	lb.	1.60	-	1.63
Antox	lb.	.49	-	.51
Aranox	lb.	——	-	3.25
Benzoquinone	lb.	1.50	-	1.75
Betanox Special	lb.	.70	-	.72
B-L-E	lb.	.49	-	.51
Carvacrol	lb.	——	-	.78
Deenax	lb.	.95	-	1.05
Eugenol C-95%	lb.	——	-	1.65
Flectol H	lb.	.49	-	.56
Flexamine	lb.	.67	-	.69
Neozone Standard	lb.	——	-	.82
A	lb.	.51	-	.53
C	lb.	——	-	.67
D	lb.	.49	-	.51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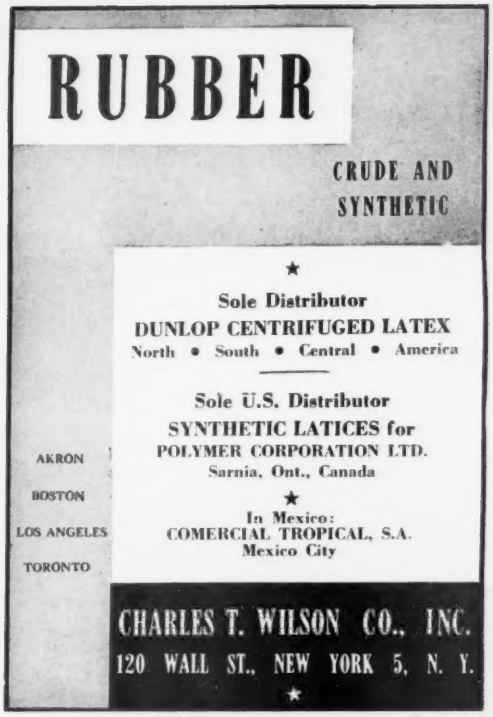
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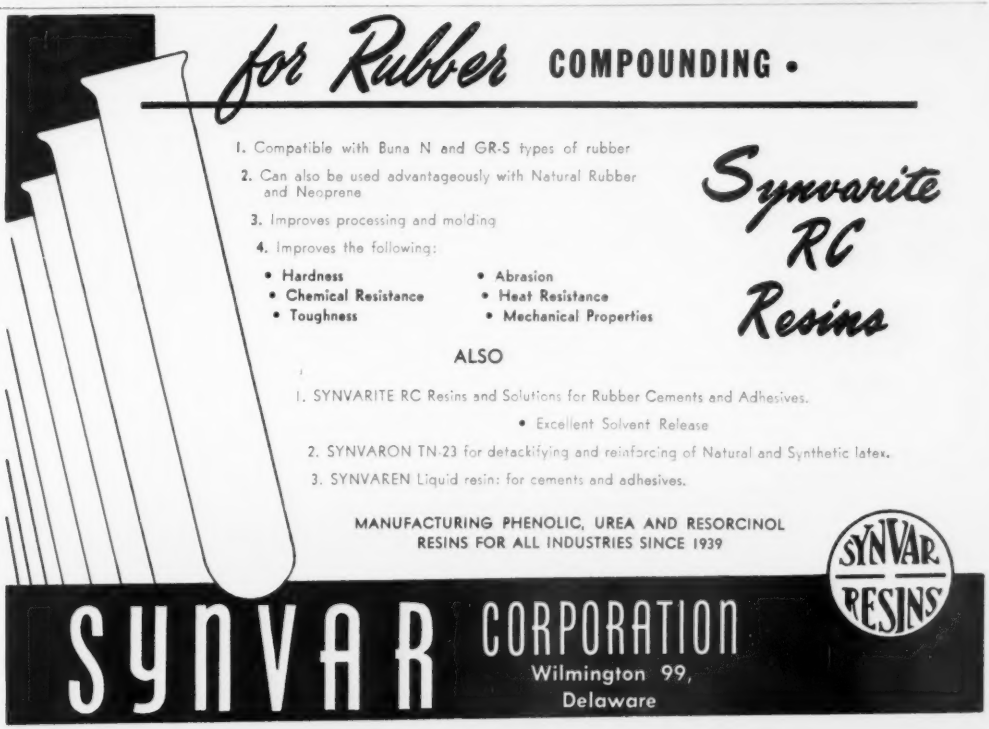
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ANTI-OXIDANTS (Cont'd)

Oxidex	lb.	——	3.00
Parazone	**lb.**	**——**	**.75**
PDA-10 and 20	lb.	.36	.38
Permalux	lb.	——	1.85
Resorcin, Tech. (dlvd.)	**lb.**	**——**	**.64**
Santoflex AW	lb.	.66	.73
B	lb.	.49	.56
BX	lb.	.60	.67
35	lb.	.67	.74
Santovar-A	lb.	1.40	1.47
O	lb.	1.20	1.27
Santowhite Crystals	lb.	1.55	1.62
Santowhite L	lb.	.49	.56
MK	lb.	1.25	1.32
S.C.R. (tons)	**lb.**	**.32**	**.34**
Sequestrene AA	lb.	——	1.00
NA2	lb.	——	.82
NA3	lb.	——	.80
Stabilite	lb.	.49	.51
Alba	lb.	.69	.74
L	lb.	.60	.62
White	lb.	.49	.51
Stabilizer No. 1	lb.	——	1.55
Stabilizer No. 320	lb.	——	.75
Sunolite	lb.	.20	.23
Tannic Acid, Tech.	lb.	.46	.48
Thermoflex	lb.	1.61	1.63
A	lb.	.98	1.00
V-G-B	lb.	.65	.67
Wing-Stay S	lb.	.48	.49

ANTI-SCORCHING AGENTS

Armeen HT	lb.	.34	.42
Benzoic Acid—Tech.	**lb.**	**——**	**.43**
Good-rite Vultrol	lb.	.58	.60
Sodium Acetate 60-62% Crystals	**lb.**	**——**	**.06**

ANTISEPTICS AND GERMICIDES

Arquad S	lb.	.22	.25
Formaldehyde (dms.)	lb.	——	.062
G-4 (bbls.)	lb.	.95	2.95
G-11	lb.	——	3.45
Nuodex 100 S.S. (dlvd.)	lb.	——	1.10
Nuodex 100 W.D. (dlvd.)	lb.	——	1.25
Nuodex Zinc 8% (dms.) (dlvd.)	lb.	.24	.28
Ortho Cresol (26°-27°)	lb.	——	.201
Retarder D	lb.	.42	.50
Soligen Drier—Copper 8% (drums)	lb.	——	.22¾
Zinc 8% (dms.)	lb.	——	.21¾
Vancide	lb.	——	.80

ANTI-WEEBING AGENTS (for Latex)

Webnix 33	lb.	1.50	2.25
34	lb.	1.75	2.25

AROMATICS (DEODORANTS)

Bouquet 149	lb.	——	3.00
Coumarin	lb.	——	2.75
Curodex 19	lb.	——	4.75
188	lb.	——	5.75
198	lb.	——	6.75
Deodorant 65	lb.	——	1.00
Deodorant L-37	lb.	2.00	2.40
L-44	lb.	2.50	2.90
N.L.T.X.	lb.	1.85	2.15
Deodorant Oil GD 3427	lb.	1.70	2.00
4440	lb.	3.00	3.50
5296	lb.	1.30	1.60
General Deodorant 18301.	**lb.**	**——**	**2.40**
Latex Perfume 5	lb.	——	3.25
6	lb.	——	7.50
9	lb.	——	.65
Naugarones (dms.)	**lb.**	**1.50**	**2.00**
Neutrodor 31	lb.	2.00	2.50
Neutroleum Delta	lb.	——	2.60
Gamma	lb.	——	2.60
Parador A	**lb.**	**1.75**	**2.25**
B	**lb.**	**.70**	**1.00**
C	**lb.**	**2.75**	**3.25**
D	**lb.**	**1.50**	**2.00**
E	**lb.**	**.25**	**.55**
F	lb.	.32	.47
GD 5280	lb.	2.00	2.50
GD 5348	lb.	1.90	3.25
I	lb.	1.95	2.25
K	lb.	.45	.60
Perfume Oil Bouquet			
Vanilla M	lb.	2.40	2.75
Resodor 11	lb.	2.00	2.50
12	lb.	1.45	1.75
Rodo No 0	**lb.**	**4.00**	**4.50**
No. 10	lb.	5.00	5.50
Rubbarome (dms.)	lb.	1.00	3.80
Rubber Perfume 12	lb.	——	2.85
Russian Leather 7	**lb.**	**——**	**4.10**
Vanillin	lb.	3.00	4.05

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.072¢	.107¢
Blowing Agent CP-975	**lb.**	**——**	**.35**
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	1.95
Sponge Paste	**lb.**	**——**	**.20**
Unicel	lb.	——	.82
ND	lb.	——	1.40
S	lb.	——	.20
Urea	lb.	.0425	.0475

BONDING AGENTS

Durez 12987	lb.	.48	.53
MDI	**lb.**	**7.00**	**7.75**
50	lb.	2.75	3.25
Pliobond 20	gal.	2.75	4.00
30	gal.	3.45	4.70
Reanite	gal.	6.75	7.25
Rex Compounds	**gal.**	**1.30**	**2.85**
Ty-Ply Q (BN & S)	gal.	6.75	8.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	8.11	8.61
Glacial—99½% (bbls.)	cwt.	14.05	14.55
Calcium Nitrate, Tech. Crystals	lb.	.07	.17
Hydroxyacetic Acid—70% (dms.)	**lb.**	**——**	**.084**
Zinc Nitrate, Tech.	lb.	——	.22½

COLORING AGENTS

Black

Aquablak B (also M, R)	lb.	.07¼	.11¾
Aquablak S	lb.	.11½	.12
Black Shield 4-35 (dms.)	**lb.**	**——**	**.0825**
Carbon Black—See *Reinforcing Agents*			
Lampblack No. 10	lb.	.06	.09
Mapico Black Iron Oxide (50 lb. bags)	lb.	.11¾	.12
Raven Black Pure Iron Oxide	cwt.	11.00	11.25

Blue

Blue GD, Dispersed	lb.	——	4.55
Blue GD Paste	lb.	——	1.80
Blue YD, Dispersed	lb.	——	2.75
Milori Blue 11840 (dlvd.)	lb.	——	.37
Monastral Fast Blue CPL	lb.	——	1.77
PCD, Dispersed	lb.	——	2.50
Ramapo Blue	lb.	3.40	3.45
Rubber Blue X-1999	lb.	——	1.15
Stan-Tone Blue	lb.	1.40	4.00
Ultramarine	lb.	.14	.30
Vansul Blue M.B.	lb.	.90	2.40
Victoria Blue BP-262-D	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	.12	.1225
Mapico Brown (50 lb. bags)	lb.	.12¾	.13

Green

Filo Green D-700 (and D-705)	lb.	——	.30
Green Chromium Oxide, Pure	cwt.	34.50	40.50
Green Chromium Oxide, Pure, Hydrated	cwt.	85.00	100.00
Green FD, Dispersed	lb.	——	1.85
Monastral Fast Green GSD, Dispersed	lb.	——	3.20
GSL	lb.	——	1.97
Permansa Green CP-594	lb.	——	1.35
Pigment Green B	lb.	——	1.35
GL-652D	lb.	.88	.93
Ramapo Green	lb.	——	4.00
Rubber Green X-1292	lb.	——	1.00
Stan-Tone Green	lb.	1.50	3.30
Vansul Green M.B.	lb.	1.05	2.45

Maroon

Stan-Tone Maroon	lb.	3.00	3.05
Vansul Maroon M.B.	lb.	1.05	2.80

Orange

Molybdate Orange	lb.	——	.45
Orange FD, Dispersed	**lb.**	**——**	**2.75**
Rubber Orange X-2065	lb.	——	2.60
Stan-Tone Orange	lb.	1.65	4.00
Vansul Orange M.B.	lb.	2.15	3.15

Red

Antimony Trisulfide	**lb.**	**.55**	**.68**
R. M. P. Sulfur Free	**lb.**	**.63**	**.68**
R. M. P. No. 3	lb.	.55	.60
Cadmium Red	lb.	.95	1.25
Cadmolith Red (bbls.)	lb.	1.30	1.55
Graphic Red (dlvd.)	lb.	——	.80
Indian Red, American, Pure	cwt.	11.75	12.00
Dioxco (English)	cwt.	11.50	11.75
Mapico Reds (50 lb. bags)	lb.	.1225	.1250
Oximony Iron Oxide	lb.	——	.09
Red Iron Oxide, Light	cwt.	11.75	12.00
Red PBD, Dispersed	lb.	——	1.75
2BD, Dispersed	lb.	——	1.80
2BL	lb.	——	1.32
PBL	lb.	——	1.65
Rubanox Red CP-762 (dlvd.)	lb.	——	1.40
Rubber Red CP-339 (dlvd.)	lb.	——	1.05
Rubber Red RT-364	lb.	——	.75
Rubber Red RT-425	lb.	——	.75
Rubber Red X-1148	lb.	——	.80
Rubbered	lb.	.1150	.1175
Sulfast Red CP-663 (dlvd.)	lb.	——	1.80
CP-787 (dlvd.)	lb.	——	1.30
Stan-Tone Red	**lb.**	**1.10**	**3.05**
Sun Burnt Red	lb.	.1150	.1175
Vansul Red M.B.	lb.	.90	2.60
Watchung Red	lb.	——	1.90

White—Lithopone

Albalith	lb.	.07½	.08½
Astrolith	lb.	.06½	.07¼
Cryptone BT	lb.	.09¾	.10¾
Eagle	lb.	.06¾	.06½
Permalith	lb.	.06¾	.06¾
Ponolith	lb.	.07¼	.08¼
Sunolith	lb.	.06½	.07¼

White—Titanium Pigments

Ti-Cal	lb.	.08	.08¾
Ti-Pure	lb.	.21	.24
Titanox A—all grades (dlvd.)	lb.	.19¼	.20¼
RA (dlvd.)	lb.	.21½	.22½
RA-10 (dlvd.)	lb.	.21½	.22¼
RA-NC (dlvd.)	lb.	.21½	.22¼
RC (dlvd.)	lb.	.07¾	.08¼
RC-HT (dlvd.)	lb.	.07¼	.08
Unitane O-220	**lb.**	**.195**	**.205**
OR-250	**lb.**	**.215**	**.225**
Zopaque	**lb.**	**.19¼**	**.20¼**

White—Zinc Oxide (American Process)

AZO-ZZZ 11 (and 22, 33, 44, 55)	lb.	.16	.17
Eagle	lb.	.16	.17
Horse Head Special	lb.	.16	.17
XX Red	lb.	.16	.17
XX-505	lb.	.17½	.18½
Protox 166	lb.	.16	.17
167	lb.	.16	.17
St. Joe Black Label	lb.	.16	.17
Green Label	lb.	.16	.17
Red Label	lb.	.16	.17

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.18¼	.19¼
Eagle Green Seal	lb.	.17¾	.18¾
Eagle Red Seal	lb.	.17¼	.18¾
Eagle White Seal	lb.	.18¼	.19¼
Florence Green Seal	lb.	.17¾	.19¾
Red Seal	lb.	.17¼	.18¼
White Seal	lb.	.18¼	.19¼
Kadox 25	lb.	.18¼	.19¼
Kadox 15, 17 and 72	lb.	.16	.17
U. S. P. 12	lb.	.19¼	.20¼

White—Zinc Sulfide

Cryptone ZS-800	lb.	.24	.25

Yellow

Anchor Brand Pure Iron Oxide	cwt.	9.00	9.25
Cadmolith Yellow (bbls.)	**lb.**	**——**	**.95**
Chrome Yellow	lb.	——	.32
Chrome Yellow 12310	lb.	——	.28
Ferrox	**cwt.**	**7.50**	**8.50**
Mapico Yellow (50 lb. bags)	lb.	.1000	.1025
Rubber Yellow X-1940	lb.	——	1.60
Stan-Tone Yellow	lb.	1.00	2.25
Toluidine Yellow	lb.	——	1.91
YL-556-D	lb.	——	.82
Oximony Iron Oxide	lb.	——	.06¾
Vansul Yellow M.B.	lb.	.95	1.55
Yellow GD, Dispersed	lb.	——	2.15
GL	lb.	——	1.62
Zinc Yellow	lb.	——	.27

DISPERSING AGENTS

Anchoid*	lb.	.24	.25
Armeen 18	lb.	.42	.50
Darvan No. 1 (and No. 2)	lb.	.21	.40
Daxad 11 (21, 23)	**lb.**	**.08**	**.35**
Dispersaid	lb.	1.25	1.35
Furala	lb.	.06½	.07½
Halloid	lb.	.04½	.05½
Marasperse C	lb.	.06	.06½
CB	lb.	.11½	.13½
N	lb.	.09	.10
Modicol C	lb.	.08	.12
Rubbex	lb.	.267	.285
Stan-Chem BQC	**lb.**	**.12¾**	**.17¾**
1067	lb.	——	.13½
1471	lb.	.1687	.2187
2251	lb.	.12¼	.17¼
Trenamine D-25	**lb.**	**.32½**	**.36**
Triethanolamine (drums) (dlvd.)	lb.	.21¾	.22½
Yelkin TT	lb.	.14	.18
Zinsper	lb.	——	.15

EXTENDERS

Advagum 1098	lb.	——	.64
Bunaweld Polymer No. 780	**lb.**	**——**	**.22**
No. 5514	lb.	——	.35
D-92 (and D-93) (dms.)	lb.	——	.12
Extender 600	lb.	——	.1480
PR-162 Latex Extender	gal.	——	1.55
Synprolac	lb.	.16	.23
Synprowax	lb.	——	.23
Vistanex	lb.	——	.32

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FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite	lb.	.19½	- 1.30
Lonite	lb.	.14	- 1.20
Pumice	lb.	.03	- .05
Aluminum Hydrate	lb.	.07	- .10
Aluminum Silicate			
Marter White	ton	18.50	- 30.00
Barium Carbonate (l.c.l.)	ton	72.50	- 90.00
Barytes			
No. 1 Floated, White	ton	37.60	- 52.40
No. 2 Floated, Unbleached	ton	35.60	- 50.40
No. 22 Barytes (c.l.)	ton	——	- 20.00
Foam A	ton	——	- 34.85
Bentonite (c.l.)	ton	——	- 11.50
SPV Volclay (c.l.)	ton	——	- 11.50
Blanc Fixe	ton	72.50	-120.00
Calcium Carbonate			
Atomite (c.l.)	ton	——	- 30.00
B.I. White No. 1 (c.l.)	ton	——	- 7.50
B.I. White No. 2 (c.l.)	ton	——	- 7.00
Blue Star XX	ton	——	- 15.50
Calcene T	ton	60.00	- 70.00
Caltec	ton	40.00	- 57.50
Calwhite	ton	——	- 17.00
Camelwhite	ton	——	- 30.00
Camaco	ton	——	- 30.00
Kalite (c.l.)	ton	——	- 50.00
Laminar	ton	——	- 30.00
Lesamite (c.l.)	ton	——	- 27.50
Millical (c.l.)	ton	——	- 32.50
Multifex	ton	——	-105.00
Non-Fer-Al	ton	——	- 25.00
Purecal M	ton	45.00	- 60.00
U	ton	120.00	-135.00
Sierracal	ton	15.00	- 18.50
Super Multifex	ton	——	-160.00
Surfex (c.l.)	ton	——	- 35.00
Suspenso (c.l.)	ton	——	- 30.00
Witcarb R (c.l.)	ton	110.00	-120.00
R-12 (c.l.)	ton	71.00	- 76.00
York White	ton	——	- 9.00
Calcium Silicate			
Silene EF	ton	120.00	-130.00
L	ton	125.00	-135.00
Calcium Sulfate, Anhydrous			
Snow White Filler	ton	——	- 18.00
Calcium Sulfate, Hydrous			
Crysta-Cal (c.l.)	ton	——	- 12.50
Terra Alba No. 1	ton	12.00	- 14.40
Chalk Whiting (l.c.l.)	lb.	.0150	- .0175
Recco Paris Whiting	ton	——	- 28.00
Clay			
Alsilite (c.l.)	ton	14.00	- 22.50
Alsite (c.l.)	ton	——	- 14.00
Aluminum Flake	ton	22.50	- 60.00
A.S.P. No. 1 (c.l.)	ton	——	- 35.00
No. 11 (c.l.)	ton	——	- 40.00
Buca (c.l.)	ton	——	- 45.00
Burgess No. 20	ton	——	- 35.00
No. 30	ton	——	- 37.00
Burgess Iceberg	ton	——	- 50.00
Burgess Polyclay	ton	——	- 45.00
Catalpo (c.l.)	ton	——	- 35.00
Champion	ton	——	- 14.00
C.S.D. (c.l.)	ton	——	- 13.50
Crown	ton	——	- 14.00
Dixie (c.l.)	ton	——	- 14.00
Hi-White R	ton	——	- 13.50
Hydratex R	ton	——	- 30.00
Kaolloid Clay (c.l.)	ton	——	- 10.50
Markham (c.l.)	ton	14.00	- 35.00
McNamee (c.l.)	ton	——	- 13.50
Oldham (c.l.)	ton	13.50	- 35.00
Paragon	ton	——	- 13.50
Pigment 5	ton	21.85	- 36.00
Pigment 22	ton	16.50	- 22.50
Pigment 33	ton	——	- 37.00
Recco (c.l.)	ton	——	- 14.00
RX-43	ton	——	- 33.00
Stan-Clay	ton	25.00	- 30.00
Stellar-R	ton	——	- 50.00
Suprex	ton	——	- 14.00
Upton	ton	19.50	- 21.50
Whitetex (c.l.)	ton	——	- 50.00
Diatomaceous Earth	ton	30.00	- 50.00
Kaylorite (c.l.)	ton	——	- 30.00
Lorite	ton	——	- 30.00
Flock			
Cotton, white and colored	lb.	.10	- .22
Filfloc F 40-9000	lb.	——	- .16
Filfloc F 6000	lb.	——	- .40
Polycel	ton	145.00	-178.00
Rayon, bleached or dyed	lb.	.81	- 1.50
Rayon, grey	lb.	——	- .18
Rayon, pink	lb.	——	- .14
Solka-Floc (l.c.l.)	lb.	.07	- .16
Wool, bleached or dyed	lb.	.70	- 1.00
Glue, Bone (dlvd.)	lb.	.18	- .20½
Leather, Shredded	lb.	.05	- .17
Lignin	lb.	.03	- .06
Indulin	lb.	.09	- .10
Limestone, Pulverized	ton	3.25	- 10.00
Industrial Filler No. 100 ton		——	- 5.75
Micro Velva	ton	45.00	- 48.00
Velvet Filler, Regular	ton	——	- 25.00
Superfine	ton	——	- 27.00
Magnesium Carbonate	lb.	.0950	- .1050
K & M Clearcarb	lb.	.1225	- .1275
Magnesium Oxide	lb.	.05	- .06
Magnesium Silicate	ton	18.00	- 35.00
Airex	ton	25.00	- 27.00
Asbestol	ton	20.00	- 22.00
Blue Star Talc	ton	——	- 23.00
L.S. Silver	ton	23.50	- 25.50
Sierra White	ton	21.25	- 23.25

FILLERS (Cont'd)

Mica	lb.	.01¼	- .07¾
Concord	lb.	.07	- .07¾
Micro-Mica	lb.	.06¾	- .07½
Mineralite (c.l.)	ton	25.00	- 40.00
Silversheen	lb.	.07	- .07¾
Triple A Mica (c.l.)	ton	——	- 25.00
Vermiculite	lb.	——	- .11
Wet Ground Biotite Mica	lb.	.05½	- .06¼
Wet Ground Mica No. 160	lb.	.07	- .07¾
Pyrophyllite			
Pyrax A (c.l.)	ton	——	- 12.50
WA (c.l.)	ton	——	- 15.00
Silica	ton	16.00	- 27.00
Blue Star	ton	——	- 20.60
Slate, Powdered (l.c.l.)	ton	15.00	- 20.00
Talc, Domestic	ton	10.00	- 27.00
Nytal 200	ton	23.00	- 40.00
300	ton	35.00	- 50.00
Walnut Shell Flour	ton	45.00	-111.00
Whiting, Commercial	ton	——	- 7.00
Cameline (c.l.)	ton	8.50	- 10.00
C-C-O White	ton	——	- 17.00
Keystone (c.l.)	ton	——	- 16.00
Rambo No. 1 White	ton	——	- 8.50
No. 6 White	ton	——	- 9.00
Snowflake (c.l.)	ton	——	- 18.00
Veroc (c.l.)	ton	——	- 8.50
Welco (c.l.)	ton	——	- 7.50
York White R (c.l.)	ton	——	- 8.00
Wood Flour	ton	22.00	- 49.00

FINISHING MATERIALS, SURFACE

Beaco Finishes	gal.	2.10	- 2.35
Black Out	gal.	4.50	- 8.00
Shellac, Orange Gum	lb.	.45	- .54
VanWax	gal.	1.25	- 1.30

FLAME RETARDANTS

Celluflux	lb.	.36½	- .38½
Chlorinated Paraffin 42	lb.	——	- .12¼
Halowax	lb.	.24	- .39
Zinc Borate 3167	lb.	.18½	- .19½
Zyrox	lb.	.50	- .79

LUBRICANTS, MOLD

Aquadag	lb.	3.50	- 4.00
Aquarex D	lb.	——	- .80
L Paste	lb.	——	- .94
ME	lb.	——	- .97
MDL Paste	lb.	——	- .33
WA Paste	lb.	——	- .28
Akro Gel	lb.	——	- .165
Borax, Granular (l.c.l.)	ton	81.00	- 86.00
Carbowax 4000	lb.	.31	- .35
Colite Concentrate (dms.)	gal.	——	- .90
Concentrex	lb.	——	- .25
D.C. 7 Compound	lb.	6.20	- 6.80
D.C. Emulsion No. 35	lb.	1.59	- 3.50
35A	lb.	1.59	- 3.50
35B	lb.	1.59	- 3.50
D.C. Mold Release Fluid	lb.	3.70	- 6.00
Dipex	lb.	.14	- .18
Dri-Lube	lb.	——	- .22
Glydag	lb.	1.30	- 2.00
Hawkeye Flake (dlvd.)	lb.	——	- .12
Kokobace	lb.	——	- .12
Latex-Lube GR (dlvd.)	lb.	.18½	- .19¾
R-66 (dlvd.)	lb.	——	- .15
Liqui-Lube (dlvd.)	lb.	——	- .14¾
NF (dlvd.)	lb.	——	- .15¼
NT (dlvd.)	lb.	——	- .15¾
Lubrex	lb.	.25	- .30
Lubri-Flo	gal.	10.00	- 12.00
Migralube	lb.	——	- .35
Mold Lubricant No. 72			
Conc.	gal.	2.50	- 4.00
No. 735	gal.	1.26	- 2.75
Moldeze No. 3	gal.	5.00	- 6.00
Mold-Brite	gal.	——	- 1.50
Mold-Slick	lb.	.253	- .271
Mold-White	gal.	——	- 2.00
Nopcolube	lb.	——	- .15
Orvus WA Paste (dms.)	lb.	——	- .25
Prodag	lb.	.28	- .42
Purity Flake (dlvd.)	lb.	——	- .14
Redotex Flakes (dlvd.)	lb.	.21⅜	- .22
Powder (dlvd.)	lb.	.21⅞	- .22½
Rubber-Flo	gal.	1.15	- 1.50
Rubber-Glo	gal.	——	- .94
Rusco Mold Paste	lb.	——	- .25
Sericite (l.c.l.)	ton	65.00	- 75.00
Thermalube	lb.	——	- .13¾
Ulco Mold Soap	lb.	.12	- .23
Ucon Lubricants	lb.	.27½	- .35½
Werkrite Flakes (dlvd.)	lb.	.18⅜	- .19
Powder (dlvd.)	lb.	.19⅛	- .19¾

LUBRICANTS, RUBBER

Extrud-o-Lube	gal.	——	- 1.84
G.B. Naphthenic Neutrals	gal.	.11	- .18
Propylene Stearate (dms.)	lb.	.68	- .78

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	- .43
Calcium Stearate	lb.	.39	- .41
Glycerized Lubricant	gal.	——	- 1.48
Polyethylene Glycol	lb.	——	- .23
Rexanol	lb.	——	- .13
Separex	lb.	——	- .25
Slab-Dip	lb.	——	- .15
Wet-Zinc	lb.	——	- .23¼
Zinc Stearate	lb.	.46	- .48

MOLD CLEANERS

Actusol (dlvd.)	gal.	1.40	- 1.60
Metso 99	cwt.	4.00	- 5.85
Granular	cwt.	3.50	- 5.15
Rubber-Sol	gal.	2.75	- 3.25
Shelblast	ton	80.00	-140.00
Sprex A.C. (dlvd.)	lb.	.15¼	- .15½

PEPTIZING AGENTS

Peptizer P-12	lb.	.84	- 1.00
RPA 2	lb.	——	- .75
3	lb.	——	- .46
3-RO	lb.	——	- .49
5	lb.	——	- .57

PLASTICIZERS & SOFTENERS

AA (drums)	lb.	.33¼	- .33¾
Acto 500	lb.	——	- .09
Adipol BCA (dms.)	lb.	.43½	- .44
2EH	lb.	.42	- .43
10A	lb.	.42	- .43
American Pine Tar	lb.	.0350	- .0473
Arneel	lb.	.22	- .27
Arolene 1980 (c.l.)	lb.	——	- .10
Aromatic Tar	gal.	.0573	- .1973
Bardol	lb.	.02½	- .03½
B	lb.	.05¾	- .06
Bayol D	gal.	——	- .382
F	gal.	——	- .52
Beeswax, Refined &			
Bleached	lb.	.60	- .65
Yellow Refined	lb.	.52	- .55
Bondogen	lb.	.55	- .60
B.R.C. No. 20	lb.	.0150	- .0160
B.R.H. 2	lb.	.0280	- .0290
BRS 700	lb.	.0175	- .0260
B.R.T. 3	lb.	.024	- .025
4	lb.	.0225	- .0235
7	lb.	.0265	- .0275
B.R.V.	lb.	.0350	- .0515
Bunarex Resins	lb.	.06½	- .07½
Bunatak AH	lb.	.08	- .09
U	lb.	——	- .15
No. 90	lb.	——	- .08
No. 210	lb.	——	- .12
Burgundy Pitch	lb.	.0843	- .0888
Butac	lb.	.10½	- .11½
Butoxyethyl Diglycol Carbonate	lb.	.40	- .41
Butyl Benzyl Sebacate	lb.	.61	- .63¾
Butyl Carbitol Perlargonate (dms.)	lb.	——	- .64
Butyl Cellosolve Perlargonate (dms.)	lb.	——	- .68
Butyl Palmitate	lb.	——	- .26½
Butyl Roleate	lb.	.176	- .18
Butyl Stearate-CP (dms.)	lb.	.31	- .33¼
BWH-1	lb.	——	- .14
Cabflex Di-BA (dms.)	lb.	.42	- .44¼
Di-OA (dms.)	lb.	.43½	- .46¼
Di-OP (dms.)	lb.	.40	- .42¾
Califlux 510, 550	lb.	.025	- .0325
G.P.	lb.	.0125	- .02
R-100	lb.	.04½	- .05½
TT	lb.	.02	- .02¾
Candellila Wax Prime	lb.	.67	- .75
Capryl Benzyl Sebacate	lb.	.67½	- .70½
Carbonex	lb.	.0325	- .0375
S Flakes	lb.	.04	- .0475
S Plastic	lb.	.0410	- .0460
644	lb.	.0375	- .0425
Carbowax 4000 (drums)	lb.	——	- .29
Cardolite 615	lb.	.33¾	- .36¾
816	lb.	.25¾	- .28¾
Carnauba Wax, Crude	lb.	.80	- 1.04
Refined	lb.	.87	- .94
Substitute	lb.	.45	- 1.08
Yellow	lb.	1.15	- 1.20
Celluflex (dms.)	lb.	.34	- .35
Ceresine Wax	lb.	.14	- .26
Chlorowax 40	lb.	.13	- .15
Contegum	lb.	.06¾	- .10¼
CTLA Polymer	gal.	.17½	- .32½
Cumar Resins	lb.	.05½	- .14½
D.C. 200 Fluid	lb.	4.14	- 6.00
D.B.M.	lb.	——	- .30
Degras, Common	lb.	——	- .12
Dibenzyl Sebacate	lb.	.74	- .76¾
Dibutoxyethyl Sebacate	lb.	——	- .5634
Dibutyl Phthalate	lb.	.29¾	- .32
Dibutyl Sebacate—Tech.	lb.	.59	- .61¾
C.P.	lb.	.61	- .63¾
Dicapryl Adipate	lb.	.40½	- .43¼
Dicapryl Phthalate	lb.	.37	- .39¾
Dicapryl Sebacate	lb.	.61½	- .64¼
Di-Carbitol Phthalate (dms.)	lb.	.41½	- .42
Dicyclohexyl Phthalate	lb.	——	- .42
Diethyl Phthalate (t.c.)	lb.	——	- .24
Di-2-ethlyhexyl Phthalate (t.c.)	lb.	——	- .37
Dihexyl Adipate	lb.	.33	- .35¼
Dihexyl Phthalate	lb.	.28½	- .31¼
Dihexyl Sebacate	lb.	.50	- .52¾
Di Isobutyl Azelate (dms.)	lb.	.54	- .57
Di-iso-octyl Adipate (dms.)	lb.	.40½	- .43¼
Di-iso-octyl Phthalate (t.c.)	lb.	.37	- .39¾
Dimethyl Phthalate (t.c.)	lb.	——	- .23
Dimethyl Sebacate	lb.	.77	- .79¼
Dioctyl Phthalate (dms.)	lb.	.37	- .39¾
Dioctyl Sebacate (dms.)	lb.	.62½	- .65¼
D.I.O.P. (dms.)	lb.	.36	- .38½
Dipolymer Oil	gal.	——	- .33

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PLASTICIZERS & SOFTENERS (Cont'd)

Dispersing Oil No. 10	lb.	.05½	.05¾
Dutrex B	lb.	.023/4	.03¾
5 and 6	lb.	.020	.031
15E	gal.	.10	.20
20, 21, 22 and 25	lb.	——	.04
ELA	lb.	——	.80
Elastex 10-P	lb.	.40	.42½
50-B	lb.	.34½	.37
DCHP	lb.	.42½	.43½
Estac	lb.	——	.16
Ethox (dms.)	lb.	.41½	.42
Flexol B-400	lb.	.27	.29
DHP	lb.	.35	.37½
DOP	lb.	.37	.39½
TOF	lb.	.41½	.44
3GH	lb.	.42	.44
3GO	lb.	.51½	.53½
4GO	lb.	.36	.38½
8HP	lb.	.38	.40½
Galex W-100	**lb.**	**.13½**	**.15**
G. B. Light Process Oil	**lb.**	**.025**	**.0325**
G. B. Naphthenic Neutrals	gal.	.11	.18
Good-Rite GP233	gal.	.45	.47¾
GP261	gal.	.40	.42¾
Harflex 500 (dms.)	lb.	.36½	.39¼
Hercolyn (dlwd.)	lb.	.16	.16½
Herron H.T.	gal.	.16	.27
Herron-Plas	lb.	——	.03¾
Herron-Wax	lb.	.05¾	.06
No. 23	lb.	.08¼	.08¾
No. 24	lb.	.07¾	.07¾
HSC No. 13	lb.	.27	.30
Hylene B	lb.	.45	.50
C	lb.	.41	.46
D	lb.	.47½	.52½
Indonex 632½ (633½, 634½, 638½)	gal.	.1100	.1700
Kapsol	lb.	.35½	.36
Kenflex	lb.	.19	.27
KP 23 (dms.)	lb.	.31½	.32½
70 (dms.)	lb.	.34	.34½
120 (dms.)	lb.	.37½	.38
140 (dms.)	lb.	.45½	.46
150 (dms.)	lb.	.29	.30
201	lb.	.41½	.42
Kremol 40	gal.	.36	.46
50	gal.	.36	.46
Kronisol (drums)	lb.	.35	.35½
Kronitex (drums)	lb.	.31½	.32½
Lanolin, Tech. Anydrous	lb.	.21	.23
Lead Oleate	lb.	——	.30½
Lindol (dms.)	lb.	.34	.35
2-Mercaptoethanol (drums)	lb.	——	.75
Methox (dms.)	lb.	.36½	.37
Methyl Laurate	**lb.**	**.25**	**.27**
Methyl Oleate	lb.	——	.20
Methyl Stearate (dms.)	lb.	——	.30
Modicol G	lb.	——	.23
R	lb.	——	.17
Montan Wax, Crude	lb.	.15	.18
Monten Wax	lb.	.12	.13
Monty Wax	lb.	——	.30½
Morflex No. 100	lb.	.37	.38¾
Natac	lb.	.10	.11
Neolene 210 (t.c.)	lb.	——	.16
212 (t.c.)	lb.	——	.14
220 (t.c.)	lb.	——	.15
Nerium	lb.	——	.09
Nevillac Resins (dms.)	lb.	.23	.45
Neville Resins (dms.)	**lb.**	**.10½**	**.15½**
Nevindene Resins (dms.)	lb.	.12½	.15½
Nevinol (dms.)	lb.	——	.17
Nevoil	lb.	.02¼	.03¼
Nevtex 10 (dms.)	lb.	.08¾	.10½
Nuba 1 (and 2) (dms.)	lb.	——	.04
3X (dms.)	lb.	.05¾	.06¼
15 (and 30) Oil (dms.)	lb.	.36¼	.38
No. 480 Oil Proof Resin	lb.	——	.18
Ohopex Q10 (dms.)	lb.	.36½	.37½
Opalwax	lb.	.37	.38
Ortho-Nitrobiphenyl	lb.	.06	.11
Ozokerite Wax No. 64 White	lb.	.31	.32
Yellow	lb.	.25	.26
P-1 (and 4)	lb.	.40	.41¾
P-4C	lb.	——	.37¼
P-8	lb.	——	.26¾
Pale 4 (and 1000)	lb.	.35½	.36
Palm Oil	lb.	——	.11
Paradene Resins (dms.)	lb.	.05	.06
Para Flux (dms.)	gal.	.1825	.1925
2016 (dms.)	gal.	.22	.23
Para Lube (l.c.l.)	lb.	.046	.048
Parmo	lb.	.06	.13½
Pepton 22	lb.	.72	.75
PG-16 (drums)	lb.	——	.23½
Picco 10 (and 25)	lb.	——	.13½
75 (and 100)	lb.	——	.13
Rubber Resin 100	lb.	.1855	.1905
S.O.S.	gal.	——	.29
Piccocizer 30	lb.	——	.05½
Piccolastic A (and B, C, D, E)	lb.	.28½	.29
FT, FHF and FX	lb.	——	.1815
T-135	lb.	.22¾	.23¼
Piccolyte S Resins	lb.	.18½	.20
Piccolyte WW Resins	**lb.**	**.45**	**.47**
Piccoumaron Resins	lb.	.06¾	.17
Piccovar	lb.	.14½	.15
Piccovol	lb.	——	.02½
Pictar	gal.	——	.25
Pigmentar	lb.	.0410	.0655

PLASTICIZERS & SOFTENERS (Cont'd)

Pigmentaroil	lb.	.0410	.0655
Plastac M	**lb.**	**——**	**.09¼**
Plasticizer 2286	lb.	——	.26¼
Plasticizer SC	lb.	.49	.52
Plasticizer VA-1	lb.	——	.40
Plasticizer W-13	lb.	.37	.38¾
Plasticizer XP-3	**lb.**	**——**	**.50**
Plastoflex 50	lb.	.26½	.29
52	lb.	.31	.32½
VS	lb.	.40	.42½
Plastogen	lb.	.07¾	.08
Plastolein 9050 (c.l.)	lb.	——	.48
9055	lb.	——	.39
9058	lb.	——	.47
9250	lb.	——	.31
9715	lb.	——	.38
9720	lb.	——	.30½
Plastone	lb.	.27	.30
Polycin 781	lb.	.40	.41
Polymel C-128	lb.	.19½	.20½
D	lb.	.22	.24
H-2	lb.	.22	.24
6	lb.	.06¾	.10
7	gal.	.23	.28
Process Oil C-255 (c.l.)	gal.	——	.22
Propylene Stearate (dms.)	lb.	——	.32
PT 400 Pine tar (600, 800) (t.c., dms.)	lb.	.0410	.0534
PX-104	lb.	.34	.42
PX-108	lb.	.38	.46
PX-208	lb.	.41½	.49
PX-404	lb.	.60	.68
Reogen	lb.	.11¾	.12
465 Resin (drums)	lb.	.05	.05½
Resin 731-C	cwt.	——	13.50
Resin C	lb.	.0200	.0285
Resinex	lb.	.03¼	.03¾
L-4	lb.	.02¾	.03
Rexflex	lb.	——	.15
Rosin Oil	gal.	.54	1.20
R.P.A. No. 2	lb.	——	.65
No. 3	lb.	——	.46
No. 5	lb.	——	.57
R.S.O. Softening Oil	lb.	.03	.05
Rubberol	lb.	——	.25¾
Rubtar	gal.	——	.40
Santicizer B-16	lb.	.50	.52
E-15	lb.	.47	.49
M-17	lb.	.44	.46
No. 107	lb.	.40	.42½
No. 140	lb.	.29	.31
No. 141	lb.	.40	.42½
No. 160	lb.	.34	.36
Sherolatum	lb.	.02¾	.05½
Softener No. 20	gal.	.09	.25
Staflex IXA	lb.	.34	.36
Stanolind Petrolatum	lb.	.037	.081
Wax	lb.	.25	.30
Staybelite Resin (dms.)	cwt.	——	9.00
Sunny South Burgundy Pitch	lb.	.1009	.1054
Sunny South Pine Tar	lb.	.0410	.0655
Sunny South Rosin Oil	gal.	.58	.86½
Superla Wax	lb.	.25	.30
Syncera Wax	lb.	.175	.225
Syn Tac (c.l.)	gal.	——	.33
Synthetic Revertant Oil	lb.	——	.16
Tar, Refined	gal.	.12	.17
K-Tarnel NR (t.c.)	lb.	——	.0851
Terpene A	gal.	——	.65
TP-90B	lb.	——	.67
TP-95	lb.	——	.65
TP-98	lb.	——	.65
Triacetin	lb.	.34	.45
Tricresyl Phosphate	lb.	.30	.32½
Turgum S	lb.	.08¾	.09¾
Vanadiset A	gal.	.13	.20
Vistac No. 1	gal.	1.00	1.16
No. 2 (c.l.)	gal.	1.22	1.26
No. 4 (c.l.)	gal.	1.32	1.36
P	lb.	——	.17
Witresin—Granular	ton	41.00	43.00
Solid	ton	36.00	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	——	.21
Refined (drums)	lb.	——	.19¼
Castorwax (min. 250 lbs.)	lb.	——	.27¼
Dutrex 7	lb.	.12	.20
Millrex	**lb.**	**——**	**.15**
Resin No. 510	lb.	.13½	.16½
Zyrox	lb.	.50	.79

PROTECTIVE & STABILIZING AGENTS

Acacia	lb.	.12¾	.21
Alpha Protein	lb.	.24	.28
Ammonium Alginate	lb.	——	.95
Arcostoocrat	lb.	——	.07½
Carob Bean Flour	lb.	——	.46
Casein	lb.	.28	.38
Ethylene Diamine 68%	lb.	.57	.58
Karaya Gum	lb.	.20	.50
Prosein	lb.	.0600	.0630
Rex Compound No. 2801	lb.	——	.15
Stablex B	lb.	.50	.95
K	lb.	.27	.35
Tragacanth Flakes	lb.	.60	1.35

RECLAIMING AGENTS

Armeens C	lb.	.50	.58
T	lb.	.42	.50
No. 517 H.B. Oil	gal.	.11½	.16½
535	gal.	.22	.27
C-6 Oil (and 28, 32)	gal.	.33	.38
C-10 Oil	gal.	.25	.30
C-33 Oil	gal.	——	.21½
Caustic Soda—Flake 76% (c.l., drums)	cwt.	——	3.60
Liquid 50% (t.c.)	**cwt.**	**——**	**2.40**
Solid 76% (c.l., dms.)	cwt.	——	3.20
Cresylic Acid (99-100%)	gal.	1.20	1.39
D-4	gal.	——	.27
E-5	gal.	——	.25
G. B. Reclaiming Oil	gal.	.12	.18
Heavy Aromatic Naphtha (t.c.)	gal.	——	.12¼
LX-77 Reclaiming Solvent	gal.	.21	.30
LX-572 Reclaiming Oil	gal.	.23	.28
Neo-Fat D-242	**lb.**	**.05½**	**.07¼**
PRR 1	gal.	.15	.35
PT 67 Light pine oil	gal.	.50	.60
PT 101 Pine tar oil	lb.	.0410	.0534
Q Oil	gal.	——	.286
Reclaiming Oil 1621	lb.	.03	.04
Reclaiming Oil 3186 (t.c.)	gal.	.28	.38½
Reclaiming Oil 3186-G	gal.	.25	.36½
Reclaiming Reagent No. 4	lb.	.12	.15
R.P.A. No. 3	lb.	——	.46
Soda Ash (c.l., bags)	cwt.	——	1.40
Solvenol 1 (dms.)	lb.	——	.36
Solvent 534	gal.	.20½	.26½
Solvent Oil 21	gal.	.24	.29
C-42	gal.	.23	.28
Union Solvent 4060-O	gal.	——	.147
X-1 Resinous Oil	lb.	.0190	.0285
X-60 Solvent	gal.	.24	.32

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98	lb.	.0740	.1225
Continental F	lb.	.0740	.1225
Croflex	lb.	.0740	.1225
Crow	lb.	.0740	.1225
Dixiedensed (and S)	lb.	.0740	.1225
Kosmobile (and S)	lb.	.0740	.1225
Kosmos T	lb.	.0740	.1225
Micronex HPC	lb.	.0740	.1225
Spheron 4	lb.	.0740	.1225
Witco Disperso No. 6	lb.	.0740	.1225

Channel, Medium Processing (MPC) (bags)

Atlantic MPC-95	lb.	.0740	.1225
Continental A	lb.	.0740	.1225
Croflex TH	lb.	.0740	.1225
Dixie R-1	lb.	.0740	.1225
Dixiedensed HM (and S-66)	lb.	.0740	.1225
Huber Arrow TX	lb.	.0740	.1225
Kosmobile HM (and S-66)	lb.	.0740	.1225
Kosmos M	lb.	.0740	.1225
Micronex Standard	lb.	.0740	.1225
Spheron 6	lb.	.0740	.1225
Texas M	lb.	.0740	.1225
Witco Disperso No. 1	lb.	.0740	.1225

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42	lb.	.0740	.1225
Continental AA	lb.	.0740	.1225
Croflex 77	lb.	.0740	.1225
Dixiedensed 77	lb.	.0740	.1225
Kosmobile 77	lb.	.0740	.1225
Micronex W-6	lb.	.0740	.1225
Spheron 9	lb.	.0740	.1225
Texas E	lb.	.0740	.1225
Witco Disperso No. 12	lb.	.0740	.1225
Wyex	lb.	.0740	.1225

Channel, Conductive (CC) (bags)

Dixie 5 Dustless	lb.	.0868	.1425
Kosmink dustless	lb.	.0868	.1425
Spheron C	lb.	.1400	.1850
Spheron N	lb.	.2500	.3000
Voltex	lb.	.1800	.2150

Furnace, Fast Extruding (FEF) (bags)

Dixie 50	lb.	.0600	.1000
Kosmos 50	lb.	.0600	.1000
Statex M	lb.	.0600	.1000
Sterling SO	lb.	.0600	.1000

Furnace, High Modulus (HMF) (bags)

Continex HMF	lb.	.0525	.0975
Dixie 40	lb.	.0550	.0950
Kosmos 40	lb.	.0550	.0950
Modulex	lb.	.0550	.0950
Statex 93	lb.	.0550	.0950
Sterling L	lb.	.0550	.0950

Furnace, Medium Abrasion (MAF) (bags)

Philblack A	lb.	.0600	.1000

Furnace, Reinforcing (RF) (bags)

Dixie 60	lb.	.0790	.1175
Kosmos 60	lb.	.0790	.1175

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF	lb.	.0400	.0800
Dixie 20	lb.	.0400	.0800
Essex	lb.	.0400	.0800
Furnex	lb.	.0400	.0800
Gastex	lb.	.0450	.0850
Kosmos 20	lb.	.0400	.0800
Pelletex	lb.	.0400	.0800
Sterling NS	lb.	.0400	.0800
Sterling R	lb.	.0450	.0850
Sterling S	lb.	.0400	.0800

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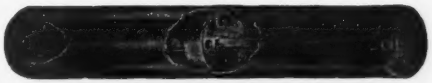

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Furnace, Fine (FF) (bags)

Statex B	lb.	.0650	.1050
Sterling 99	lb.	.0600	.1050

Furnace, High Abrasion (HAF) (bags)

Aromex	lb.	.0790	.1250
Philblack O	lb.	.0790	.1190
Statex R	lb.	.0790	.1250
Vulcan 3	lb.	.0790	.1220

Furnace, Very Fine (VFF) (bags)

Statex K	lb.	.0790	.1250

Thermal, Fine (FT) bags)

P-33 (c.l.)	lb.	—	.0550

Thermal, Medium (MT) (bags)

Thermax (c.l.)	lb.	—	.0350
Thermax, Stainless (c.l.)	lb.	—	.0450

REINFORCING AGENTS—SILICA

Hi-Sil	lb.	.11	.12½

REINFORCING AGENTS—MISCELLANEOUS

Darex Copolymer No. 3	lb.	.42	.44
X34	lb.	.37	.39
X43 (and 43E)	lb.	.38	.40
Darex Copolymer Latex No. 3 (and X34)	**lb.**	**.36½**	**.50**
Durex 12687 (and 12707)	**lb.**	—	**.32**
Durex 13355	**lb.**	—	**.26**
Good-Rite Resin 50	lb.	.41	.43
Kralac A	lb.	.39	.40
Marbon S and S-1	lb.	.41	.48
8000	lb.	.41	.48
Marmix	lb.	.41	.48
Pliolite Latex 190	lb.	.30	.34
Pliolite NR	lb.	.74	.76
Pliolite S6 (and S6B) Resin	lb.	.36	.37
C-3 Masterbatch	lb.	.47	.48
C-4 Masterbatch	lb.	.45	.46
G Masterbatch	lb.	.35	.36
G50 Masterbatch	lb.	.35	.36
N Masterbatch	lb.	.40	.41
R Masterbatch	lb.	.43	.44
Polyco 220	lb.	.13	.15

RETARDERS

Dutch Boy Normasal	lb.	—	.47¼
ESEN	lb.	—	.36
Retarder ASA	lb.	—	.55
Retarder PD	lb.	.34	.36
Retarder W	lb.	—	.43
Retardex	lb.	.47	.50

RUBBER SUBSTITUTES

Mineral Rubber

38	ton	38.00	40.00
Black Diamond	ton	38.00	40.00
Byerlyte	ton	47.00	54.00
Gilsonite, Selects (c.l.)	ton	33.50	36.00
Hard Hydrocarbon (dms.)	ton	42.50	44.50
Herron Flake	ton	—	45.00
Mineral Rubber, solid	ton	42.50	44.50
Pioneer	ton	35.00	46.00

Vulcanized Vegetable Oils (Factice)

Amberex	lb.	.28	.32
Brown	lb.	.1310	.1955
Dispersed	lb.	.22	.42
Neophax	lb.	.16	.24
White	lb.	.13	.24

Miscellaneous Rubber Substitutes

G.B. Asphaltenes	lb.	.06	.06½
Gilsowax B	lb.	.09	.11
Resin No. 1098 (drums)	lb.	—	.62
No. 1198	lb.	.46¾	.49¾

SOLVENTS

Acetone (dlvd.)	lb.	.08½	.11
American Dipentine	gal.	.47	.68
American Pine Oil	gal.	.75½	.95½
Amsco Lactol Spirits (t.c.)	gal.	—	.17
Rubber Solvent (t.c.)	gal.	—	.16
Solv A (t.c.)	gal.	—	.21½
Solv A-80 (t.c.)	gal.	—	.26
Solv B (t.c.)	gal.	—	.25
Solv B-90 (t.c.)	gal.	—	.28½
Solv D (t.c.)	gal.	—	.53¾
Special Naphthalite (t.c.)	gal.	—	.16
Textile Spirits (t.c.)	gal.	—	.17
Amyl Chlorides, Mixed (t.c.l.) (drums)	lb.	.10	.11
Aromatic Solvent 40	gal.	—	.219
Benzol 90%	**gal.**	**.17**	**.24**
Butyl Acetate (t.c.)	lb.	.13	.175
Butyl Alcohol (t.c.)	lb.	.13	.175
Secondary (dlvd.)	lb.	.11	.13½
Tertiary (dlvd.)	lb.	12	.14½
Carbon Bisulfide, Tech.	lb.	.0440	.0800
Carbon Tetrachloride	lb.	.08	.08½
Cosol 1	**gal.**	**.30**	**.38**
Cosol 2	**gal.**	**.30**	**.38**
Cyclohexane	lb.	.09¾	.11¾
Cyclohexanone	**lb.**	**.25**	**.27** *
Diacetone, Pure (dlvd.)	lb.	.12	.14½

SOLVENTS (Cont'd)

Dichlorethyl Ether (dms.)	lb.	.165	.17
Formal (dms.)	**lb.**	**.265**	**.27**
Dichloropentane (t.c.l.)	lb.	.04	.07
Dicom	gal.	.30	.42
Dipentene 123 (dms.)	**gal.**	**.35**	**.36**
Halowax Oil	**lb.**	**.25**	**.37**
Heptanes (t.c.)	gal.	.17	.22
Hexalin Cyclohexanol	lb.	.20	.22 *
Hexanes (t.c.)	gal.	.17	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.47	.64
Ether, Ref. (dlvd.)	gal.	.05	.07½
Mesityl Oxide (dlvd.)	lb.	.11½	.14
Methyl Acetone, Syn. (drums, dlvd.)	gal.	.615	.65
Methyl Ethyl Ketone	lb.	.11	.13½
Methyl Isobutyl Ketone (dlvd.)	lb.	.13	.15½
N-5 Pentane Mix. (t.c.)	gal.	—	.13½
N-6 Hexanes (t.c.)	gal.	—	.14
N-7 Hexanes (t.c.)	gal.	—	.13
Penetrell	gal.	.47	.68
Petrolene (t.c.)	gal.	—	.13125
Picolines, Alpha, Refined	lb.	—	.40
Mixed	lb.	—	.30
Proprietary Alcohol (t.c.)	**gal.**	—	**.43½**
Pyridine, Refined	lb.	—	1.05
Quinoline	lb.	—	.61¾
Rubber Solvent (t.c.)	gal.	—	.16
Rubsol (t.c.)	gal.	—	.11875
Skellysolve B (Hexanes) (t.c.)	**gal.**	—	**.148**
C (Heptanes) (t.c.)	gal.	—	.141
E (Octanes) (t.c.)	gal.	—	.155
R (Solvent Naphtha)	gal.	—	.114
Solvenol (dms.)	**gal.**	—	**.36**
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100 (t.c.)	gal.	—	.28
150 (t.c.)	gal.	—	.28
Sunny South Dipentine	gal.	.47	.68
Sunny South Pine Oil	gal.	.75½	.95½
Toluene (drums)	gal.	—	.28
Toluol (t.c.)	**gal.**	—	**.30**
Trichlorethane	lb.	.11	.12
Triglycol Dichloride (dms)	lb.	.53	.54
Tromex	**lb.**	**.078**	**.083**
Union Thinner 1	gal.	—	.161
3	gal.	—	.161
7	gal.	—	.151
2-50-W Hi-Flash	gal.	—	.38
X-7 Sp. Heptanes (t.c.)	gal.	—	.11

STABILIZING AGENTS (for Vinyl Resins)

Basic Silicate White Lead	lb.	.16¼	.17¼
No. 201	lb.	.21¼	.22¼
BVS	lb.	—	.58¾
Cadmium Stearate	lb.	—	1.25
Dutch Boy DS-207	lb.	—	.55
Plumb-O-Sil A	lb.	—	.30½
B	lb.	—	.31¾
Tribase	lb.	—	.27½
Dythal	lb.	—	.42½
Lead Stearate, Precip.	lb.	.36	.38
Fused	lb.	—	.35½
Lithium Stearate	lb.	.63	.65
Stabelan E	lb.	1.25	1.40
XL	**lb.**	**.55**	**.65**
Stabilizer No. 3	lb.	—	2.00
Stabilizer No. 21	lb.	—	.90
Stabilizer No. 52	lb.	—	2.00
Stabilizer E6B	lb.	—	.85
Stabilizer JCX	lb.	—	.49
Stabilizer L	lb.	—	.60
Stabilizer SN	lb.	—	.42
Stabilizer V-1-N	lb.	—	.50
Stabilizer V-9	lb.	—	.85
Stabilizer V-7939	lb.	—	.60
Vanstay	**lb.**	**.33**	**.35**

STIFFENING AGENTS

Calco S. A.	lb.	.80	.83

SUN CHECKING AGENTS

Antisol	lb.	—	.23
Antisun	lb.	—	.21
Heliozone	**lb.**	**.25**	**.26**
Sharples Wax	lb.	.23	.28
Sunolite	lb.	.20	.23
Sunproof	lb.	.25	.26
Imp.	lb.	.23	.24
Jr.	lb.	.18	.19
Tonox	lb.	.50	.52

TACKIFIERS

Advaresin 100	lb.	.13½	.14
Arreco 493-49B	lb.	.15	.17
700-25A	lb.	.14	.16
U2-24	lb.	.11	.13
Galex (drums)	lb.	.15½	.19¼
Indopol H-300 (bbls.)	gal.	1.12	1.16
Koresin	lb.	.73	.75
Liquid Rubber Flux	lb.	—	.14
Nilox	cwt.	12.50	13.50
Pentalyn A (dlvd.)	lb.	.12½	.13
Resin V	**gal.**	—	**.23¾**
Rubtack	**lb.**	—	**.12**
Staybelite Ester No. 10 (dlvd.)	lb.	.19¾	.20¾
Synthol	lb.	—	.24¾
Vistac No. 1	gal.	1.00	1.16
No. 2 (c.l.)	gal.	1.22	1.26
No. 4 (c.l.)	gal.	1.32	1.36
A	**lb.**	—	**.20¾**
Zirex	cwt.	12.00	12.80

THICKENERS (FOR LATEX)

Alcogum AN-6	lb.	—	.05
AN-10	lb.	—	.08½
Betanol (drums)	lb.	—	.70
Emulsorex No. 5	lb.	—	.35
Lecithin	**lb.**	**.12**	**.17**
Modicol VD	lb.	—	.12½
VE	lb.	—	.10¾
VF	lb.	—	.10¾
VK	lb.	—	.07
Polyco 296	lb.	.13	.13½
Propylene Laurate (dms.)	lb.	.57	.67
Sodium Silicate	cwt.	1.50	2.65

VULCANIZING AGENTS

Selenium

Ancasal*	lb.	—	2.00
Vandex	lb.	—	2.25

Sulfur

Blackbird	**cwt.**	—	**2.30**
Crystex	lb.	.19½	.23
Darex Dispersed Sulphur	lb.	.12	.17
Dispersed Sulfur	lb.	.12	.17
Devil (c.l.)	**cwt.**	—	**1.75**
Insoluble Sulfur 60	lb.	.12½	.13
Spider	**cwt.**	—	**2.30**
Star (c.l.)	**cwt.**	—	**2.25**
Tire (c.l.)	cwt.	—	1.75
Tube	cwt.	—	2.25

Tellurium

Ancatel*	lb.	—	2.00
Latex Telloy	lb.	—	2.00
Telloy	lb.	—	2.00

WASHING & FINISHING AGENTS

Apcolene (t.c.)	gal.	—	.12375

WETTING AGENTS

Advawet No. 10	lb.	—	.35
No. 15	lb.	—	.20½
No. 33	lb.	—	.39
Aerosol OT 70% Clear	**lb.**	**.80**	**1.00**
Alrosol (dms.)	lb.	—	.40
Alrosperse	lb.	—	.18
Aquarex D	lb.	—	.80
MDL Paste	lb.	—	.33
ME	lb.	—	.97
NS	lb.	—	.60
WA Paste	lb.	—	.28
Areakap 50	**lb.**	**.30**	**.38**
Dry 100	lb.	.60	.72
Aresket 240	**lb.**	**.30**	**.38**
Dry 300	lb.	.60	.72
Aresklene 375	**lb.**	**.42**	**.57**
Dry 400	lb.	.70	.84
Armacs	**lb.**	**.39**	**.76**
Arquads	lb.	.21	.61
Etho-chemicals	**lb.**	**.34**	**.80**
Lecithin	lb.	.18	.26
Modicol L	lb.	—	.58
N	lb.	—	.40
S	lb.	—	.22
Nopco 1086-A	lb.	.42	.50
1187-X	lb.	—	.14½
Parnol	lb.	.13	.18
Santomerse D	lb.	.44	.65
S	lb.	.13	.25
Sorbit P	lb.	—	.25
Stablex G	lb.	.50	.70
Tergitol 4 (dms., dlvd.)	lb.	—	.30
7 (dms., dlvd.)	lb.	—	.37
O8 (dms., dlvd.)	lb.	—	.30
P28 (dms., dlvd.)	lb.	—	.19
Trenamine W-30	lb.	—	.15
Vultamol	**lb.**	—	**.17½**
Wetsit Conc.	lb.	.25	.32

MISCELLANEOUS CHEMICALS

Acto 450 (550-W, 600, 630)	lb.	.109	.145
Agchem SA-17	**lb.**	—	**.29**
Aquarex SMO	lb.	—	.50
A.S.T.M. Oil No. 1 (and No. 3)	gal.	1.00	1.15
Copper Inhibitor X-872-L	lb.	—	1.95
D-Tac	lb.	.21	.23
2-Ethylhexanol (dms.)	**lb.**	**.25**	**.36**
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.25	.25½
MODX	lb.	.295	.345
NBC	lb.	—	1.50
Para Resin No. 2457 (c.l.)	lb.	—	.04
No. 2718 (c.l.)	**lb.**	—	**.04**
Pigmented Filmite	**lb.**	—	**.16½**
Polyvinyl Methyl Ether	**lb.**	—	**1.00**
Reference Fluid SR-6	gal.	.85	1.00
SR-10	gal.	.60	.75
Resin No. 1226	**lb.**	**.31½**	**.36½**
Rio Resin	lb.	.52	.54
RR-10	lb.	—	.35
Santocel	**lb.**	—	**.50**
Sherosope L, N, F-445 and P	lb.	.12½	.15
Sublac B2	lb.	.26	.28
PX-5	lb.	.26	.28
Synpep N (drums)	**lb.**	—	**.54**
Thiokol LP-2	lb.	—	.96
LP-3	lb.	—	.96
LP-8	lb.	—	1.25
Tyzonite	**lb.**	**.21½**	**.22¾**
Vanfre	**gal.**	**2.00**	**2.50**
Vinsol Resin—Lumps	cwt.	—	3.25

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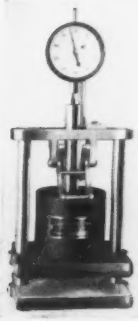

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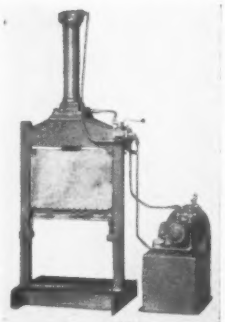

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